PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-157829

(43)Date of publication of application : 31.05.2002

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(51)Int.Cl. G11B 20/12

G11B 7/004

G11B 20/10

G11B 27/00

G11B 27/10

H04N 5/85

H04N 5/765

H04N 5/92

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(21)Application number : 2000-301342

(22)Date of filing : 29.09.2000

(71)Applicant : MATSUSHITA ELECTRIC IND CO LTD

(72)Inventor : GOTOU YOSHITOSHI
UEDA HIROSHI
SASAKI YOSHIYUKI
FUKUSHIMA YOSHIHISA

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(30)Priority

Priority number :	11280857	Priority date :	30.09.1999	Priority country :	JP
	2000272263		07.09.2000		JP

(54) INFORMATION RECORDING MEDIUM, ITS RECORDING METHOD AND REPRODUCING METHOD, ITS SYSTEM CONTROL PART, INFORMATION RECORDING DEVICE AND INFORMATION REPRODUCING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an information recording medium which can record real time data into a rewritable optical disk while continuous reproduction is guaranteed and to provide its method and its the device.

SOLUTION: A reproduction standard model constituted of the increase quantity of data accumulated in a buffer memory and the data quantity accumulated in a buffer memory for time when pickup accesses data is introduced so that a reproduction device continuously reproduces real time data. A real time extent is arranged on the information recording medium by using a real time reproduction condition.

LEGAL STATUS

[Date of request for examination]	01.03.2002
[Date of sending the examiner's decision of rejection]	
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	3698630
[Date of registration]	15.07.2005
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	

[Date of extinction of right]

CLAIMS

[Claim(s)]

[Claim 1] It is the information record medium with which the real-time file which contains said real-time data so that said real-time data may continue and may be reproduced, when a playback standard model reproduces real-time data is recorded. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least two or more real-time extents assigned to the sector which continued logically in said volume space. Said i+1st real-time extents It is arranged in the location which fills real-time playback condition T(i) <=(B(i-1)+D (i))/Vout. Here T (i) : The time amount which said pickup accesses from the termination of said i-th real-time extent at the head of said i+1st real-time extents, As B(i) =B(i-1)+D(i)-VoutxT(i):B(0) =0 Said pickup from the termination of said i-th real-time extent When it accesses at the head of the i+1st real-time extents Amount-of-data D(i) =(Vin-Vout)xS (i)/Vin which is alike and is accumulated into said buffer memory : when said pickup reads said real-time data from said i-th real-time extent Augend of the data stored into said buffer memory, however size of said buffer memory are set to M. At least at the time of D(i) >M-B (i-1) D (i) it amends below to M-B (i-1) -- having -- Vout: -- a data rate in case said real-time data are passed through and transmitted to said decode module from said buffer memory -- Vin: The information record medium made into the data rate when said pickup reading

said real-time data from said real-time extent, and transmitting to said buffer memory, and the data size of said S(i):i position real-time extent.

[Claim 2] D (i) is amended with D(i) =(Vin-Vout)xS(i)/Vin+B(i-1)-kx (VoutxTk) at the time of D(i) >M-B (i-1). Here Tk: The information record medium according to claim 1 made into the maximum rotational delay of said information record medium, and the integer part of k: (D(i)+B(i-1)-M) (/(VoutxTk) +1).

[Claim 3] Said real-time extent is an information record medium according to claim 1 assigned to the sector which continued physically.

[Claim 4] Said file management information is an information record medium including the positional information which shows said real-time extent according to claim 1.

[Claim 5] Said file management information is an information record medium containing the 1st identification information which shows whether it is a real-time file containing said real-time data according to claim 1.

[Claim 6] Said file management information is an information record medium containing the 2nd identification information which shows that arrangement of said real-time extent is arranged according to said real-time playback conditions according to claim 1.

[Claim 7] Said file management information is an information record medium according to claim 1 which includes the information showing the conditions by which said real-time extent has been arranged as an extended attribute.

[Claim 8] It is the information record medium with which the real-time file which contains said real-time data so that said real-time data may continue and may be reproduced, when a playback standard model reproduces real-time data is recorded. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are

recorded on at least two or more real-time extents assigned to the sector which continued logically in said volume space. Said i+1st real-time extents It is arranged in the location which fills real-time playback condition T(i) <=(B(i-1)+D (i))/Vout. Here T (i) : The time amount which said pickup accesses from the termination of said i-th real-time extent at the head of said i+1st real-time extents, As B(i) =B(i-1)+D(i)-VoutxT(i):B(0) =0 Said pickup from the termination of said i-th real-time extent When it accesses at the head of the i+1st real-time extents Amount-of-data D(i) =(Vin-Vout)xS (i)/Vin which is alike and is accumulated into said buffer memory : when said pickup reads said real-time data from said i-th real-time extent Augend of the data stored into said buffer memory, however size of said buffer memory are set to M. At least at the time of D(i) >M-B (i-1) D (i) it amends below to M-B (i-1) -- having -- Vout: -- a data rate in case said real-time data are passed through and transmitted to said decode module from said buffer memory -- Vin : The data rate when said pickup reading said real-time data from said real-time extent, and transmitting to said buffer memory, It considers as the data size of said S(i):i position real-time extent. Said real-time file is an information record medium with which the data of the real-time extent which real-time data are the file by which additional record was carried out, and was already recorded are recorded into the newly recorded real-time extent.

[Claim 9] D (i) is amended with D(i) =(Vin-Vout)xS(i)/Vin+B(i-1)-kx (VoutxTk) at the time of D(i) >M-B (i-1). Here Tk: The information record medium according to claim 8 made into the maximum rotational delay of said information record medium, and the integer part of k: (D(i)+B(i-1)-M) (/(VoutxTk) +1).

[Claim 10] Said real-time extent is an information record medium according to claim 8 assigned to the sector which continued physically.

[Claim 11] Said file management information is an information record medium including the positional information which shows said real-time extent according to claim 8.

[Claim 12] Said file management information is an information record medium containing the 1st identification information which shows whether it is a real-time file containing said real-time data according to claim 8.

[Claim 13] Said file management information is an information record medium containing the 2nd identification information which shows that arrangement of said real-time extent is arranged according to said real-time playback conditions according to claim 8.

[Claim 14] Said file management information is an information record medium according to claim 8 which includes the information showing the conditions by which said real-time extent has been arranged as an extended attribute.

[Claim 15] It is the information record medium with which the real-time file which contains said real-time data so that said real-time data may continue and may be reproduced, when a playback standard model reproduces real-time data is recorded. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least two or more real-time extents assigned to the sector which continued logically in said volume space. Said i+1st real-time extents It is arranged in the location which fills real-time playback condition T(i) <=(B(i-1)+D (i))/Vout. Here T (i) : The time amount which said pickup accesses from the termination of said i-th real-time extent at the head of said i+1st real-time extents, As B(i) =B(i-1)+D(i)-VoutxT(i):B(0) =0 Said pickup from the termination of said i-th real-time extent When it accesses at the head of the i+1st real-time extents Amount-of-data D(i) =(Vin-Vout)xS (i)/Vin which is alike and is accumulated into said buffer memory : when said pickup reads said real-time data from said i-th real-time extent Augend of the data stored into said buffer memory, however size of said buffer memory are set to M. At least at the time of D(i) >M-B (i-1) D (i) it amends below to M-B (i-1) -- having -- Vout: -- a data rate in case said real-time data are passed through and transmitted to said decode module from said buffer memory -- Vin : The data rate when said pickup reading said real-time data from said real-time extent,

and transmitting to said buffer memory, It considers as the data size of said S(i):i position real-time extent. Said real-time file is a file by which additional record of the real-time data was carried out. Said real-time data The information record medium recorded into the real-time extent which it is compressed by the MPEG method, and the data which consist of one or more GOP(s) recorded on the real-time end of file before carrying out additional record were re-encoded, and was newly recorded.

[Claim 16] D (i) is amended with D(i) =(Vin-Vout)xS(i)/Vin+B(i-1)-kx (VoutxTk) at the time of D(i) >M-B (i-1). Here Tk: The information record medium according to claim 15 made into the maximum rotational delay of said information record medium, and the integer part of k: (D(i)+B(i-1)-M) (/(VoutxTk) +1).

[Claim 17] Said real-time extent is an information record medium according to claim 15 assigned to the sector which continued physically.

[Claim 18] Said file management information is an information record medium including the positional information which shows said real-time extent according to claim 15.

[Claim 19] Said file management information is an information record medium containing the 1st identification information which shows whether it is a real-time file containing said real-time data according to claim 15.

[Claim 20] Said file management information is an information record medium containing the 2nd identification information which shows that arrangement of said real-time extent is arranged according to said real-time playback conditions according to claim 15.

[Claim 21] Said file management information is an information record medium according to claim 15 which includes the information showing the conditions by which said real-time extent has been arranged as an extended attribute.

[Claim 22] It is an information record medium equipped with the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. In said data, said real-time data contain one [at least] data of image data and voice data including real-time data. Said real-time data are recorded on at least one or more real-time extents assigned to the sector which continued logically in said volume space.

Said file is an information record medium with which it consists of at least one or more real-time extents, a linking loss extent is arranged in front of said real-time extent, and a linking gap is formed in said real-time extent.

[Claim 23] Said linking loss extent is an information record medium including one ECC block according to claim 22.

[Claim 24] Said file management information is an information record medium including the positional information which shows said real-time extent according to claim 22.

[Claim 25] Said file management information is an information record medium containing the identification information which shows whether it is a real-time file containing said real-time data according to claim 22.

[Claim 26] The information record medium according to claim 22 with which the data-type bit of the sector is set as 1 when a data-type bit is recorded on the field which records the physical additional information of the sector in said linking loss extent and the following sector is contained in said linking loss extent except for a linking sector in order to identify said linking loss extent.

[Claim 27] The information record medium according to claim 22 with which runout area is formed before said linking gap, and said real-time data are recorded in the runout area in said linking loss extent.

[Claim 28] It is the record approach which records the real-time file which contains said real-time data so that said real-time data may continue and may be reproduced, when a playback standard model reproduces real-time data on an information record medium. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. The step which searches the field which fulfills the following real-time playback conditions as a prior assignment field from the free space of the plurality in said volume space which continued logically, The step which records said real-time data on said

prior assignment field, The sector on which said real-time data were recorded and which continued logically is made into a real-time extent. The step which records said file management information for managing said real-time data as said real-time file is included. Here said i+1st prior assignment fields Real-time playback condition T(i) <=(B(i-1)+D (i))/Vout is filled. T (i) : as the time amount which said pickup accesses from said i-th prior assignment end-of-region edge at the head of said i+1st prior assignment fields, and B(i) =B(i-1)+D(i)-VoutxT(i):B(0) =0 Said pickup from said i-th prior assignment end-of-region edge When it accesses at the head of the i+1st prior assignment fields amount-of-data D(i) =(Vin-Vout)xS(i)/Vin: accumulated into said buffer memory -- the augend of the data stored into said buffer memory when said pickup reads said data from an assignment-before No. i impending report field -- however Size of said buffer memory is set to M. At least at the time of D(i) >M-B (i-1) D (i) it amends below to M-B (i-1) -- having -- Vout: -- a data rate in case said real-time data are passed through and transmitted to said decode module from said buffer memory -- Vin: The record approach made into the data rate when said pickup reading said data from said prior assignment field, and transmitting to said buffer memory, and the data size of said S(i):i position prior assignment field.

[Claim 29] D (i) is amended with D(i) =(Vin-Vout)xS(i)/Vin+B(i-1)-kx (VoutxTk) at the time of D(i) >M-B (i-1). Here Tk: The record approach according to claim 28 made into the maximum rotational delay of said information record medium, and the integer part of k: (D(i)+B(i-1)-M) (/(VoutxTk) +1).

[Claim 30] Said prior assignment field is the record approach according to claim 28 assigned to the sector which continued physically per ECC block.

[Claim 31] Said file management information is the record approach including the positional information which shows said real-time extent according to claim 28.

[Claim 32] Said file management information is the record approach containing the 1st identification information which shows whether it is a real-time file containing said real-time data according to claim 28.

[Claim 33] Said file management information is the record approach containing the 2nd identification information which shows that arrangement of

said real-time extent is arranged according to said real-time playback conditions according to claim 28.

[Claim 34] Said file management information is the record approach according to claim 28 which includes the information showing the conditions by which said real-time extent has been arranged as an extended attribute.

[Claim 35] It is the record approach which carries out additional record of the real-time file which contains said real-time data so that said real-time data may continue and may be reproduced, when a playback standard model reproduces real-time data at an information record medium. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least one or more real-time extents assigned to the sector which continued logically in said volume space. The step which calculates whether the amount of data accumulated into said buffer memory causes overflow when a playback standard model reproduces said real-time extent, The step which amends the amount of data accumulated in said buffer memory below in the size of said buffer memory in causing said overflow, The step which calculates whether the amount of data accumulated into said buffer memory causes an underflow when a playback standard model accesses to the prior assignment field newly assigned from said real-time extent, The step which searches said real-time extent which does not cause an underflow in access to said prior assignment field in causing said underflow, The step which records the real-time data already recorded on the real-time extent which causes said underflow into said prior assignment field newly assigned, The record approach which includes the step which records the newly added real-time data into said prior assignment field, and the step which records said file management information by making into a real-time extent the sector on which said real-

time data were recorded, and which continued logically.

[Claim 36] Said prior assignment field is the record approach according to claim 35 assigned to the sector which continued physically per ECC block.

[Claim 37] Said file management information is the record approach including the positional information which shows said real-time extent according to claim 35.

[Claim 38] Said file management information is the record approach containing the 1st identification information which shows whether it is a real-time file containing said real-time data according to claim 35.

[Claim 39] Said file management information is the record approach containing the 2nd identification information which shows that arrangement of said real-time extent is arranged according to said real-time playback conditions according to claim 35.

[Claim 40] Said file management information is the record approach according to claim 35 which includes the information showing the conditions by which said real-time extent has been arranged as an extended attribute.

[Claim 41] It is the record approach which carries out additional record of the real-time file which contains said real-time data so that said real-time data may continue and may be reproduced, when a playback standard model reproduces real-time data at an information record medium. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least one or more real-time extents assigned to the sector which continued logically in said volume space. The step which reads the data which consist of one or more GOP(s) recorded on the real-time end of file before said real-time data's being data compressed by the MPEG method and carrying out additional record, The step which re-encodes said read data, and the step which records said

re-encoded data into the newly assigned prior assignment field, The record approach which includes the step which records the real-time data which newly carry out additional record into said prior assignment field, and the step which records said file management information.

[Claim 42] Said prior assignment field is the record approach according to claim 41 assigned to the sector which continued physically per ECC block.

[Claim 43] Said file management information is the record approach including the positional information which shows said real-time extent according to claim 41.

[Claim 44] Said file management information is the record approach containing the 1st identification information which shows whether it is a real-time file containing said real-time data according to claim 41.

[Claim 45] Said file management information is the record approach containing the 2nd identification information which shows that arrangement of said real-time extent is arranged according to said real-time playback conditions according to claim 41.

[Claim 46] Said file management information is the record approach according to claim 41 which includes the information showing the conditions by which said real-time extent has been arranged as an extended attribute.

[Claim 47] It is the record approach which records information on the information record medium equipped with the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. The step which judges whether it is the real-time file whose file contains real-time data, The step which records said file management information on said volume space, and when it is judged with said file being a real-time file When the undershirt run of a buffer occurs during the step which continues and records said real-time data on a linking loss extent, and record of said real-time data The record approach which includes the step which forms a linking gap in the real-time extent on which said real-time data are recorded.

[Claim 48] Said linking loss extent is the record approach including one ECC block according to claim 47.

[Claim 49] Said file management information is the record approach including

the positional information which shows said real-time extent according to claim 47.

[Claim 50] Said file management information is the record approach containing the identification information which shows whether it is a real-time file containing said real-time data according to claim 47.

[Claim 51] The record approach according to claim 47 that the data-type bit of the sector includes further the step set as 1 when the following sector is contained in said linking loss extent except for a linking sector to the field which records the physical additional information of the sector in said linking loss extent in order to identify said linking loss extent.

[Claim 52] The record approach according to claim 47 which includes further the step which records said real-time data in the runout area in said linking loss extent.

[Claim 53] It is the information recording device which records the real-time file which contains said real-time data so that said real-time data may continue and may be reproduced, when a playback standard model reproduces real-time data on an information record medium. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. From the free space of the plurality in said volume space which continued logically, the field which fulfills the following real-time playback conditions as a prior assignment field Allocation, The sector on which said real-time data and said file management information were recorded, and said real-time data were recorded and which continued logically is made into a real-time extent. It has a file system processing means to create said file management information for managing said real-time data as said real-time file. Here Said i+1st prior assignment fields fill real-time playback condition $T(i) <= (B(i-1)+D(i))/Vout$. T (i) : as the time amount which

said pickup accesses from said i-th prior assignment end-of-region edge at the head of said i+1st prior assignment fields, and B(i) =B(i-1)+D(i)-VoutxT(i):B(0) =0 Said pickup from said i-th prior assignment end-of-region edge When it accesses at the head of the i+1st prior assignment fields amount-of-data D(i) =(Vin-Vout)xS(i)/Vin: accumulated into said buffer memory -- the augend of the data stored into said buffer memory when said pickup reads said prior assignment field from an assignment-before No. i impending report field -- however Size of said buffer memory is set to M. At least at the time of D(i) >M-B (i-1) D (i) it amends below to M-B (i-1) -- having -- Vout: -- a data rate in case said real-time data are passed through and transmitted to said decode module from said buffer memory -- Vin: The information recording device made into the data rate when said pickup reading said real-time data from said prior assignment field, and transmitting to said buffer memory, and the data size of said S(i):i position prior assignment field.

[Claim 54] D (i) is amended with D(i) =(Vin-Vout)xS(i)/Vin+B(i-1)-kx (VoutxTk) at the time of D(i) >M-B (i-1). Here Tk: The information recording device according to claim 53 made into the maximum rotational delay of said information record medium, and the integer part of k: (D(i)+B(i-1)-M) (/(VoutxTk) +1).

[Claim 55] Said prior assignment field is an information recording device according to claim 53 assigned to the sector which continued physically per ECC block.

[Claim 56] Said file management information is an information recording device including the positional information which shows said real-time extent according to claim 53.

[Claim 57] Said file management information is an information recording device containing the 1st identification information which shows whether it is a real-time file containing said real-time data according to claim 53.

[Claim 58] Said file management information is an information recording device containing the 2nd identification information which shows that arrangement of said real-time extent is arranged according to said real-time playback conditions according to claim 53.

[Claim 59] Said file management information is an information recording device according to claim 53 which includes the information showing the conditions by which said real-time extent has been arranged as an extended attribute.

[Claim 60] It is the information recording device which carries out additional record of the real-time file which contains said real-time data so that said real-time data may continue and may be reproduced, when a playback standard model reproduces real-time data at an information record medium. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least one or more real-time extents assigned to the sector which continued logically in said volume space. It calculates whether the amount of data accumulated into said buffer memory when a playback standard model reproduces said real-time extent causes overflow. In causing said overflow, while amending the amount of data accumulated in said buffer memory below in the size of said buffer memory It calculates whether the amount of data accumulated into said buffer memory when a playback standard model accesses to the prior assignment field newly assigned from said real-time extent causes an underflow. An amount-of-data count means to search said real-time extent which does not cause an underflow in access to said prior assignment field in causing said underflow, The real-time data already recorded on the real-time extent which causes said underflow The information recording device further equipped with a data-logging means to record into said prior assignment field newly assigned, and to record the newly added real-time data into said prior assignment field, and the file structure processing means which creates and records said file management information.

[Claim 61] Said prior assignment field is an information recording device

according to claim 60 assigned to the sector which continued physically per ECC block.

[Claim 62] Said file management information is an information recording device including the positional information which shows said real-time extent according to claim 60.

[Claim 63] Said file management information is an information recording device containing the 1st identification information which shows whether it is a real-time file containing said real-time data according to claim 60.

[Claim 64] Said file management information is an information recording device containing the 2nd identification information which shows that arrangement of said real-time extent is arranged according to said real-time playback conditions according to claim 60.

[Claim 65] Said file management information is an information recording device according to claim 60 which includes the information showing the conditions by which said real-time extent has been arranged as an extended attribute.

[Claim 66] It is the information recording device which carries out additional record of the real-time file which contains said real-time data so that said real-time data may continue and may be reproduced, when a playback standard model reproduces real-time data at an information record medium. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least one or more real-time extents assigned to the sector which continued logically in said volume space. Said real-time data are data compressed by the MPEG method. A re-encoding means to record into the prior assignment field which read the data which consist of one or more GOP(s) recorded on the real-time end of file before carrying out additional record, re-encoded said read data,

and was newly assigned, The information recording device further equipped with the file structure processing means which creates and records said file management information by making into a real-time extent the sector on which said real-time data were recorded, and which continued logically.

[Claim 67] Said prior assignment field is an information recording device according to claim 66 assigned to the sector which continued physically per ECC block.

[Claim 68] Said file management information is an information recording device including the positional information which shows said real-time extent according to claim 66.

[Claim 69] Said file management information is an information recording device containing the 1st identification information which shows whether it is a real-time file containing said real-time data according to claim 66.

[Claim 70] Said file management information is an information recording device containing the 2nd identification information which shows that arrangement of said real-time extent is arranged according to said real-time playback conditions according to claim 66.

[Claim 71] Said file management information is an information recording device according to claim 66 which includes the information showing the conditions by which said real-time extent has been arranged as an extended attribute.

[Claim 72] It is the information recording device which records information on the information record medium equipped with the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. A recording-mode setting means to judge whether it is the real-time file whose file contains real-time data, A file structure processing means to record said file management information on said volume space, and when it is judged with said file being a real-time file When the undershirt run of a buffer occurs during a linking setting means to continue and record said real-time data on a linking loss extent, and record of said real-time data The information recording device equipped with the linking control section which forms a linking gap in the real-time extent on which said real-time data are recorded.

[Claim 73] Said linking loss extent is an information recording device including one ECC block according to claim 72.
[Claim 74] Said file management information is an information recording device including the positional information which shows said real-time extent according to claim 72.
[Claim 75] Said file management information is an information recording device containing the identification information which shows whether it is a real-time file containing said real-time data according to claim 72.
[Claim 76] The information recording device according to claim 72 with which the data-type bit of the sector was further equipped with the linking control section set as 1 when the following sector was contained in said linking loss extent except for a linking sector to the field which records the physical additional information of the sector in said linking loss extent in order to identify said linking loss extent.
[Claim 77] The information recording device according to claim 72 further equipped with the runout control section which records said real-time data in the runout area in said linking loss extent.
[Claim 78] It is the system control section of the information recording device which records the real-time file which contains said real-time data so that said real-time data may continue and may be reproduced, when a playback standard model reproduces real-time data on an information record medium. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. From the free space of the plurality in said volume space which continued logically, the field which fulfills the following real-time playback conditions as a prior assignment field Allocation, The sector which recorded said real-time data and said file management information, and recorded said real-time data and which continued logically is made into a real-

time extent. It has a file system processing means to create said file management information for managing said real-time data as said real-time file. Here Said i+1st prior assignment fields fill real-time playback condition T(i) <=(B(i-1)+D (i))/Vout. T (i) : as the time amount which said pickup accesses from said i-th prior assignment end-of-region edge at the head of said i+1st prior assignment fields, and B(i) =B(i-1)+D(i)-VoutxT(i):B(0) =0 Said pickup from said i-th prior assignment end-of-region edge When it accesses at the head of the i+1st prior assignment fields amount-of-data D(i) =(Vin-Vout)xS(i)/Vin: accumulated into said buffer memory -- the augend of the data stored into said buffer memory when said pickup reads said prior assignment field from an assignment-before No. i impending report field -- however Size of said buffer memory is set to M. At least at the time of D(i) >M-B (i-1) D (i) it amends below to M-B (i-1) -- having -- Vout: -- a data rate in case said real-time data are passed through and transmitted to said decode module from said buffer memory -- Vin: The system control section made into the data rate when said pickup reading said real-time data from said prior assignment field, and transmitting to said buffer memory, and the data size of said S(i):i position prior assignment field.

[Claim 79] It is the system control section of the information recording device which carries out additional record of the real-time file which contains said real-time data so that said real-time data may continue and may be reproduced, when a playback standard model reproduces real-time data at an information record medium. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least one or more real-time extents assigned to the sector which continued logically in said volume space. It calculates whether the amount of data accumulated into said buffer memory when a playback

standard model reproduces said real-time extent causes overflow. In causing said overflow, while amending the amount of data accumulated in said buffer memory below in the size of said buffer memory It calculates whether the amount of data accumulated into said buffer memory when a playback standard model accesses to the prior assignment field newly assigned from said real-time extent causes an underflow. An amount-of-data count means to search said real-time extent which does not cause an underflow in access to said prior assignment field in causing said underflow, The real-time data already recorded on the real-time extent which causes said underflow A data-logging means to record into said prior assignment field newly assigned, and to record the newly added real-time data into said prior assignment field, The system control section further equipped with the file structure processing means which makes the sector which recorded said real-time data, and which continued logically a real-time extent, and creates and records said file management information.

[Claim 80] It is the playback approach which reproduces data from the information record medium with which the real-time file which contains said real-time data so that said real-time data may continue and may be reproduced, when a playback standard model reproduces real-time data was recorded. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least two or more real-time extents assigned to the sector which continued logically in said volume space. Said i+1st real-time extents It is arranged in the location which fills real-time playback condition T(i) <=(B(i-1)+D (i))/Vout. Here T (i) : The time amount which said pickup accesses from the termination of said i-th real-time extent at the head of said i+1st real-time extents, As B(i) =B(i-1)+D(i)-VoutxT(i):B(0) =0 Said pickup from the termination of said i-th

real-time extent When it accesses at the head of the i+1st real-time extents Amount-of-data D(i) =(Vin-Vout)xS (i)/Vin which is alike and is accumulated into said buffer memory : when said pickup reads said real-time data from said i-th real-time extent Augend of the data stored into said buffer memory, however size of said buffer memory are set to M. At least at the time of D(i) >M-B (i-1) D (i) it amends below to M-B (i-1) -- having -- Vout: -- a data rate in case said real-time data are passed through and transmitted to said decode module from said buffer memory -- Vin : The data rate when said pickup reading said real-time data from said real-time extent, and transmitting to said buffer memory, It considers as the data size of said S(i):i position real-time extent. The positional information of a real-time extent, The step which acquires the identification information which shows that said real-time extent is arranged according to real-time playback conditions, The step which reads data from said real-time extent with the data rate more than Vin of a playback standard model, The step which carries out the temporary storage of said read real-time data to said buffer memory, The playback approach equipped with the step which reads the data stored in said buffer memory, and is decoded by the decoder, and the step accessed to the following real-time extent within access-time T (i) of a playback standard model.

[Claim 81] Said file management field is the playback approach according to claim 80 which includes further the step which notifies a playback mode for said extended attribute to a drive beforehand before reproducing, read-out and from the management domain of said real-time file including the information showing the conditions by which said real-time extent has been arranged as an extended attribute.

[Claim 82] From an information record medium equipped with the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector Are the playback approach which reproduces real-time data, and said data contain real-time data. Said real-time data contain one [at least] data of image data and voice data. Said real-time data are recorded on at least one or more real-time extents assigned to the sector which continued logically in said volume space. Said file consists of at least one or more real-time extents. A linking loss extent is arranged in

front of said real-time extent. The step which judges whether it is the real-time file said whose file a linking gap is formed in said real-time extent, and contains real-time data, The playback approach which includes the step which performs continuous data playback actuation, without performing recovery processing even if the playback error by the invalid data recorded on said linking gap occurs in playback actuation of the data from said real-time extent. [Claim 83] It is the information regenerative apparatus which reproduces data from the information record medium with which the real-time file which contains said real-time data so that said real-time data may continue and may be reproduced, when a playback standard model reproduces real-time data was recorded. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least two or more real-time extents assigned to the sector which continued logically in said volume space. Said i+1st real-time extents It is arranged in the location which fills real-time playback condition T(i) <=(B(i-1)+D (i))/Vout. Here T (i) : The time amount which said pickup accesses from the termination of said i-th real-time extent at the head of said i+1st real-time extents, As B(i) =B(i-1)+D(i)-VoutxT(i):B(0) =0 Said pickup from the termination of said i-th real-time extent When it accesses at the head of the i+1st real-time extents Amount-of-data D(i) =(Vin-Vout)xS (i)/Vin which is alike and is accumulated into said buffer memory : when said pickup reads said real-time data from said i-th real-time extent Augend of the data stored into said buffer memory, however size of said buffer memory are set to M. At least at the time of D(i) >M-B (i-1) D (i) it amends below to M-B (i-1) -- having -- Vout: -- a data rate in case said real-time data are passed through and transmitted to said decode module from said buffer memory -- Vin : The data rate when said pickup reading said real-time data from said real-time extent, and transmitting to said

buffer memory, It considers as the data size of said S(i):i position real-time extent. Said information regenerative apparatus A file structure processing means to acquire the positional information of a real-time extent, and the identification information which shows that said real-time extent is arranged according to real-time playback conditions, The data playback section which reads data from said real-time extent with a predetermined data rate, The buffer memory which carries out the temporary storage of said read real-time data, It has a decoder for reading and decoding the data stored in said buffer memory. The data reproducibility ability realized with the access engine performance of said data playback section, a data read-out rate, and the size of said buffer memory The information regenerative apparatus characterized by filling the engine performance which can reproduce data continuously from the real-time extent recorded according to said real-time playback conditions.

[Claim 84] Said file structure processing means is the information regenerative apparatus according to claim 83 further equipped with a notice means of a playback mode to notify a playback mode for said extended attribute to a drive beforehand before reproducing, read-out and, from the management domain of said real-time file including the information showing the conditions by which said real-time extent has been arranged as an extended attribute.

[Claim 85] From an information record medium equipped with the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector Are the information regenerative apparatus which reproduces real-time data, and said data contain real-time data. Said real-time data contain one [at least] data of image data and voice data. Said real-time data are recorded on at least one or more real-time extents assigned to the sector which continued logically in said volume space. Said file consists of at least one or more real-time extents. A linking loss extent is arranged in front of said real-time extent. A file structure processing means to judge whether it is the real-time file whose file a linking gap is formed in said real-time extent, and contains real-time data, The information regenerative apparatus equipped with the data playback section which performs continuous data playback actuation, without

performing recovery processing even if the playback error by the invalid data recorded on said linking gap occurs in playback actuation of the data from said real-time extent.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the information record medium which records the real-time data containing common data, and video datas and audio data, such as a program, per sector and its record approach, the playback approach, its system control section and its information recording device, and an information regenerative apparatus.

[0002]

[Description of the Prior Art] There is an optical disk as an information record medium which has a sector structure. In recent years, densification, large-capacity-izing, and multimedia-ization are progressing and even the public welfare device is expected as an available medium from the personal computer.

[0003] A DVD-RAM disk is explained as an example of the conventional rewriting mold optical disk, referring to a drawing below. Drawing 16 shows the physical layout of the rewriting mold optical disk in the conventional ZCLV (Zoned Constant Linear Velocity) format.

[0004] A rewriting mold optical disk consists of the DMA (Defect ManagementArea) field which manages the defective sector on a lead-in groove field and a disk from inner circumference, a data area, and a lead-out field in drawing 16 (a). Digital data is recorded on each field and digital data is managed in the unit called a sector. A data area consists of a spare field for carrying out alternative processing of the defective sector, and a field from a zone 0 to a zone 34. In each zone, data are recorded per 2048 bytes of

physical sector.

[0005] As shown in drawing 16 (b), as for the information field of a rewriting mold optical disk, a physical sector number (PSN:Physical Sector Number) is given for every physical sector from inner circumference. On the other hand, the space which can record user data is defined for every logical sector as volume space where the logical sector number (LSN:Logical Sector Number) was given. That is, volume space is the space except the defective sector registered into a free space in a lead-in groove field, a DMA field, and a spare field, and PDL in DMA (Primary Defective List) from the information field, and the guard field and lead-out field between each zone. Moreover, in order to improve the dependability of data, an error correction is made considering 16 logical sectors as one ECC block.

[0006] Furthermore, the defective sector detected by performing search FAI processing at the time of initialization of a disk is registered into PDL, and a logical sector number is not assigned to these defective sectors. For this reason, even if the logical address of a sector is continuing, there are the above things for which the field of discontinuity is included physically. Moreover, by the linear replacement method, a spare field is substituted for the ECC block containing a defective sector, and the defective sector detected during record of data is registered into SDL in DMA (Secondary Defect List). Thus, the rewriting mold optical disk has structure in order to improve the dependability of data.

[0007] In the case of a DVD-RAM disk with a defective control mechanism, defective management is performed by drive, but the disk without a defective control mechanism like CD-RW is performed by the file system using the sparing table on which the defective management which used the above-mentioned SDL, and the same defective management were specified UDF specification. In the case of a CD-RW disk, the spare field to which the ECC block containing a defective sector was set as volume space is substituted, and this alternative information is managed using the sparing table specified by UDF (Universal Disk Format) specification.

[0008] Next, DVD-R of 3.95Gbyts(es) (G cutting tool) specified by DVD-R physics specification (Version 1.0) is explained as an example of the

conventional write once optical disk. In addition, a volume file structure is ISO/IEC as long as there is no detailed publication especially. It shall have the DS specified to 13346 specification or UDF specification.

[0009] Drawing 17 shows an example of the directory structure recorded on an optical disk, the REALTIME directory 202 only for video applications is recorded on the bottom of a root directory 201, and the audio video data (AV data are called below) compressed in the MPEG format is recorded as a VIDEO.VRO file 203. Moreover, two or more still picture files recorded with the digital camera etc. are recorded as FILEA.DAT.

[0010] Drawing 18 (a) - (c) is drawing where AV data show arrangement of an extent in case additional record is carried out to a VIDEO.VRO file. An extent here is the field where the sector on which data were recorded continued.

[0011] When introduction and AV data are recorded, after recording 32KB of linking loss field 561, AV data are recorded on an extent 562 and record the padding field 563 where 00h data were recorded on the sector to the boundary of an ECC block. Since the error correction using ECC (Error CorrectionCode: error correction sign) is performed per 16 sectors a DVD disk case here, record of data is performed per 16 sectors. Next, when the file structure relevant to this DVD-R disk is recorded and BODA out is recorded as read-out becomes possible with playback dedicated system, a record section is formed after the padding field 563. Although BODA out is not illustrating, it has the size of 10 to about 100MB.

[0012] By the DVD-R disk on which data are recorded sequentially, while AV data are recorded on an extent 565 after recording the linking loss field 564 by the 2nd postscript as shown in drawing 18 (b) since AV data are added sequentially from the non-record section inner circumference which remains in the periphery section of a disk, the sector to the boundary of an ECC block is recorded as a padding field 566.

[0013] Similarly, as shown in drawing 18 (c), in the postscript of 3rd AV data, the linking loss field 567, an extent 568, and the padding field 569 are recorded. Thus, AV data are divided and added to two or more extents.

[0014] Next, the linking scheme of a DVD-R disk is explained using drawing 19 (a) - (d). The undershirt run of a buffer occurs according to the difference

of the data rate of AV data to record, and the record rate of the data to a disk. If the undershirt run of this buffer occurs, a drive interrupts record, and after predetermined data are stored into a buffer, it will resume record temporarily. At this time, a linking loss field is formed of a linking scheme.

[0015] Drawing 19 (a) is drawing showing arrangement of an extent when the undershirt run of a buffer occurs twice during record of AV data. An extent 222,223,224 is the field where AV data were recorded, the linking loss field 220 is a field recorded in advance of record of AV data, and the linking loss field 226,227 is a field recorded by the undershirt run of a buffer.

[0016] Drawing 19 (b) and (c) are drawings showing the configuration of the field in a sector unit, when the linking loss field 220 is recorded, it begins from the middle in the 1st sector, and 00h data are recorded to the termination of the 16th sector. When recording an extent 222 succeedingly, it is recorded to the head section in the following sector which adjoins this extent from the head of the 1st sector, and record actuation is once completed. Next, when recording the linking loss field 226, record begins from the middle in the 1st sector. Thus, in DVD-R, since the postscript of data is performed within a sector, a sector including the field connected by the linking scheme is called the linking sector 225.

[0017] The detailed linking scheme in a linking sector is shown in drawing 19 (d). 1 sector consists of a 26 sink frame, 241,242,243,244 shows the field recorded on a trailer, when an extent 222 is recorded, 241,242 shows the sink and data division of the 1st sink frame, respectively, and 243,244 shows the sink and data division of the 2nd sink frame, respectively. Data division 242,244 have the size which can record 91 bytes and 86 bytes of data, respectively. Moreover, the field after 245 shows the field formed in the 1st sector of an ECC block of the linking loss field 226, when an extent 223 is recorded, 245 shows the data division of the 2nd sink frame, and 246,247 shows the sink in a sink frame.

[0018] In order not to decide the data which should be recorded on the runout area 228 at the time of record of an extent 222, 00h data are recorded. Moreover, it is the field overwritten to the field to which the 82nd byte to the 87th byte of field 229 of the 2nd sink frame was previously recorded by the

postscript, and since data effective in this field are unrecordable, it is called a linking gap. Thus, the linking sector 225 containing the linking gap 229 has physical constraint that data are correctly unrecordable. For this reason, the data with which dependability is demanded define 32KB of ECC block containing this linking sector as a linking loss field, and do not record effective data.

[0019]

[Problem(s) to be Solved by the Invention] However, it was difficult to reproduce the recorded real-time data continuously by access of the physical discontinuity field formed between extents or in the extent from the disk which recorded real-time data on the optical disk with the above formats, when reproducing real-time data.

[0020] When data were especially recorded with the conventional file system, it had the trouble that playback of data will be interrupted for the read-out delay by the defective sector and defective block which were registered into the data readout delay, PDL, and SDL when accessing the guard field arranged on the zone boundary, and the data readout delay by access between each record section by distributing to two or more free areas, and recording data.

[0021] Moreover, since discernment of a real-time file and a general file was not completed, when the error took place during playback of real-time data, in order to reproduce again the location which was not able to be reproduced, the technical problem that delay occurred also occurred.

[0022] Moreover, it was not understood whether the real-time data recorded since there was no identification information which shows what was recorded on the condition for reproducing real-time data and its condition could be reproduced continuously.

[0023] Moreover, the technical problem that data may be unable to carry out continuation playback between the termination of the data already recorded on the real-time file on which the record machine was already recorded when carrying out additional record of the real-time data, and the start edge of the data to add occurred.

[0024] Moreover, in the case of the real-time data encoded by the MPEG

method, the conditions of encoding differed between the termination of the data already recorded, and the start edge of the data to add, and the technical problem that data could not carry out continuation playback occurred.

[0025] Moreover, when it is the optical disk with which data are recorded using a linking scheme like a DVD-R disk, whenever the undershirt run of a buffer occurs, 32KB of linking loss field is formed. For this reason, it was divided into two or more extents, the address information of each extent managed with a file system became large, and the field where data were recorded had the technical problem that reproducing became difficult, in the playback special-purpose machine which has a limit in memory size. Moreover, since the rate that a linking loss field is recorded became large when AV data with a low data rate are recorded, the technical problem that recording efficiency worsened also occurred.

[0026] This invention aims at offering the information record medium which makes realizable continuation playback of the real-time data to a recordable optical disk and its record approach, the playback approach and its information recording device, and an information regenerative apparatus in view of the above-mentioned trouble.

[0027]

[Means for Solving the Problem] When a playback standard model reproduces real-time data, the information record medium concerning this invention It is the information record medium with which the real-time file which contains said real-time data so that said real-time data may be reproduced continuously is recorded. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least two or more real-time extents assigned to the sector which continued logically in said volume space. Said i+1st real-time

extents It is arranged in the location which fills real-time playback condition T(i) <=(B(i-1)+D (i))/Vout. Here T (i) : The time amount which said pickup accesses from the termination of said i-th real-time extent at the head of said i+1st real-time extents, As B(i) =B(i-1)+D(i)-VoutxT(i):B(0) =0 Said pickup from the termination of said i-th real-time extent The amount of data accumulated into said buffer memory when it accesses at the head of the i+1st real-time extents, D(i) =(Vin-Vout)xS(i)/Vin: -- the augend of the data stored into said buffer memory when said pickup reads said real-time data from an account of No. i impending real-time extent -- however Size of said buffer memory is set to M. At least at the time of D(i) >M-B (i-1) D (i) it amends below to M-B (i-1) -- having -- Vout: -- a data rate in case said real-time data are passed through and transmitted to said decode module from said buffer memory -- Vin : The data rate when said pickup reading said real-time data from said real-time extent, and transmitting to said buffer memory, S(i): It considers as the data size of said i position real-time extent, and the above-mentioned purpose is attained by that.

[0028] D (i) is amended with D(i) =(Vin-Vout)xS(i)/Vin+B(i-1)-kx (VoutxTk) at the time of D(i) >M-B (i-1). Here Tk: It is good also as the maximum rotational delay of said information record medium, and integer part of k: (D(i)+B(i-1)-M) /(VoutxTk) +1).

[0029] Said real-time extent may be assigned to the sector which continued physically.

[0030] Said file management information may also include the positional information which shows said real-time extent.

[0031] Said file management information may also contain the 1st identification information which shows whether it is a real-time file containing said real-time data.

[0032] Said file management information may also contain the 2nd identification information which shows that arrangement of said real-time extent is arranged according to said real-time playback conditions.

[0033] Said file management information may also include the information showing the conditions by which said real-time extent has been arranged as an extended attribute.

[0034] When a playback standard model reproduces real-time data, other information record media concerning this invention It is the information record medium with which the real-time file which contains said real-time data so that said real-time data may be reproduced continuously is recorded. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least two or more real-time extents assigned to the sector which continued logically in said volume space. Said i+1st real-time extents It is arranged in the location which fills real-time playback condition T(i) <=(B(i-1)+D (i))/Vout. Here T (i) : The time amount which said pickup accesses from the termination of said i-th real-time extent at the head of said i+1st real-time extents, As B(i) =B(i-1)+D(i)-VoutxT(i):B(0) =0 Said pickup from the termination of said i-th real-time extent The amount of data accumulated into said buffer memory when it accesses at the head of the i+1st real-time extents, D(i) =(Vin-Vout)xS(i)/Vin: -- the augend of the data stored into said buffer memory when said pickup reads said real-time data from an account of No. i impending real-time extent -- however Size of said buffer memory is set to M. At least at the time of D(i) >M-B (i-1) D (i) it amends below to M-B (i-1) -- having -- Vout: -- a data rate in case said real-time data are passed through and transmitted to said decode module from said buffer memory -- Vin : The data rate when said pickup reading said real-time data from said real-time extent, and transmitting to said buffer memory, It considers as the data size of said S(i):i position real-time extent. Said real-time file is recorded into the real-time extent on which the data of a real-time extent with which real-time data are the file by which additional record was carried out, and were already recorded were newly recorded, and the above-mentioned purpose is attained by that.

[0035] D (i) is amended with D(i) =(Vin-Vout)xS(i)/Vin+B(i-1)-kx (VoutxTk) at

the time of D(i) >M-B (i-1). Here Tk: It is good also as the maximum rotational delay of said information record medium, and integer part of k: (D(i)+B(i-1)-M) (/(VoutxTk) +1).

[0036] Said real-time extent may be assigned to the sector which continued physically.

[0037] Said file management information may also include the positional information which shows said real-time extent.

[0038] Said file management information may also contain the 1st identification information which shows whether it is a real-time file containing said real-time data.

[0039] Said file management information may also contain the 2nd identification information which shows that arrangement of said real-time extent is arranged according to said real-time playback conditions.

[0040] Said file management information may also include the information showing the conditions by which said real-time extent has been arranged as an extended attribute.

[0041] When, as for other information record media, a playback standard model reproduces real-time data to the pan concerning this invention It is the information record medium with which the real-time file which contains said real-time data so that said real-time data may be reproduced continuously is recorded. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least two or more real-time extents assigned to the sector which continued logically in said volume space. Said i+1st real-time extents It is arranged in the location which fills real-time playback condition T(i) <=(B(i-1)+D (i))/Vout. Here T (i) : The time amount which said pickup accesses from the termination of said i-th real-time extent at the head of said i+1st real-time extents, As B(i)

=B(i-1)+D(i)-VoutxT(i):B(0) =0 Said pickup from the termination of said i-th real-time extent The amount of data accumulated into said buffer memory when it accesses at the head of the i+1st real-time extents, D(i) =(Vin-Vout)xS(i)/Vin: -- the augend of the data stored into said buffer memory when said pickup reads said real-time data from an account of No. i impending real-time extent -- however Size of said buffer memory is set to M. At least at the time of D(i) >M-B (i-1) D (i) it amends below to M-B (i-1) -- having -- Vout: -- a data rate in case said real-time data are passed through and transmitted to said decode module from said buffer memory -- Vin : The data rate when said pickup reading said real-time data from said real-time extent, and transmitting to said buffer memory, It considers as the data size of said S(i):i position real-time extent. Said real-time file is a file by which additional record of the real-time data was carried out. Said real-time data It is compressed by the MPEG method, and said real-time data containing one or more GOP(s) are re-encoded, and are recorded into the newly recorded real-time extent, and the above-mentioned purpose is attained by that.

[0042] D (i) is amended with D(i) =(Vin-Vout)xS(i)/Vin+B(i-1)-kx (VoutxTk) at the time of D(i) >M-B (i-1). Here Tk: It is good also as the maximum rotational delay of said information record medium, and integer part of k: (D(i)+B(i-1)-M) (/(VoutxTk) +1).

[0043] Said real-time extent may be assigned to the sector which continued physically.

[0044] Said file management information may also include the positional information which shows said real-time extent.

[0045] Said file management information may also contain the 1st identification information which shows whether it is a real-time file containing said real-time data.

[0046] Said file management information may also contain the 2nd identification information which shows that arrangement of said real-time extent is arranged according to said real-time playback conditions.

[0047] Said file management information may also include the information showing the conditions by which said real-time extent has been arranged as an extended attribute.

[0048] It is the information record medium equipped with volume space for other information record media to record at least the file management information for managing the data recorded as a file, and said file per sector at the pan concerning this invention. In said data, said real-time data contain one [at least] data of image data and voice data including real-time data. Said real-time data are recorded on at least one or more real-time extents assigned to the sector which continued logically in said volume space. Said file consists of at least one or more real-time extents. A linking loss extent is arranged in front of said real-time extent, a linking gap is formed in said real-time extent, and the above-mentioned purpose is attained by that.

[0049] Said linking loss extent may also include one ECC block.

[0050] Said file management information may also include the positional information which shows said real-time extent.

[0051] Said file management field may also contain the identification information which shows whether it is a real-time file containing said real-time data.

[0052] In order to identify said linking loss extent, a data-type bit is recorded on the field which records the physical additional information of the sector in said linking loss extent, and when the following sector is contained in said linking loss extent, except for a linking sector, the data-type bit of the sector may be set as 1.

[0053] Runout area may be formed before said linking gap, and said real-time data may be recorded in the runout area in said linking loss extent.

[0054] When a playback standard model reproduces real-time data, the record approach concerning this invention It is the record approach which records the real-time file which contains said real-time data so that said real-time data may be reproduced continuously on an information record medium. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least

the file management information for managing the data recorded as a file, and said file per sector. The step which searches the field which fulfills the following real-time playback conditions as a prior assignment field from the free space of the plurality in said volume space which continued logically, The step which records said real-time data on said prior assignment field, and the step which records said file management information for managing said real-time data as said real-time file are included. Here Said i+1st prior assignment fields fill real-time playback condition T(i) <=(B(i-1)+D (i))/Vout. T (i) : as the time amount which said pickup accesses from said i-th prior assignment end-of-region edge at the head of said i+1st prior assignment fields, and B(i) =B(i-1)+D(i)-VoutxT(i):B(0) =0 The amount of data accumulated into said buffer memory when said pickup accesses at the head of the i+1st prior assignment fields from said i-th prior assignment end-of-region edge, D(i) =(Vin-Vout)xS (i)/Vin : The augend of the data stored into said buffer memory when said pickup reads said prior assignment field from said i-th prior assignment field, Size of said buffer memory is set to M. At least at the time of D(i) >M-B (i-1) however, D (i) it amends below to M-B (i-1) -- having -- Vout: -- a data rate in case said real-time data are passed through and transmitted to said decode module from said buffer memory -- Vin: It considers as the data rate when said pickup reading said real-time data from said prior assignment field, and transmitting to said buffer memory, and the data size of said S(i):i position prior assignment field, and the above-mentioned purpose is attained by that.

[0055] D (i) is amended with D(i) =(Vin-Vout)xS(i)/Vin+B(i-1)-kx (VoutxTk) at the time of D(i) >M-B (i-1). Here Tk: It is good also as the maximum rotational delay of said information record medium, and integer part of k: (D(i)+B(i-1)-M) (/(VoutxTk) +1).

[0056] Said prior assignment field may be assigned to the sector which continued physically per ECC block.

[0057] Said file management information may also include the positional information which shows said real-time extent.

[0058] Said file management information may also contain the 1st identification information which shows whether it is a real-time file containing said real-time data.

[0059] Said file management information may also contain the 2nd identification information which shows that arrangement of said real-time extent is arranged according to said real-time playback conditions.
[0060] Said file management field may also include the information showing the conditions by which said real-time extent has been arranged as an extended attribute.
[0061] When a playback standard model reproduces real-time data, other record approaches concerning this invention It is the record approach which carries out additional record of the real-time file which contains said real-time data so that said real-time data may be reproduced continuously at an information record medium. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least one or more real-time extents assigned to the sector which continued logically in said volume space. The step which calculates whether the amount of data accumulated into said buffer memory causes overflow when a playback standard model reproduces said real-time extent, The step which amends the amount of data accumulated in said buffer memory below in the size of said buffer memory in causing said overflow, The step which calculates whether the amount of data accumulated into said buffer memory causes an underflow when a playback standard model accesses to the prior assignment field newly assigned from said real-time extent, The step which searches said real-time extent which does not cause an underflow in access to said prior assignment field in causing said underflow, The step which records the real-time data already recorded on the real-time extent which causes said underflow into said prior assignment field newly assigned, The step which records the newly added real-time data into said prior assignment field, and the step which records said file management

information are included, and the above-mentioned purpose is attained by that.

[0062] Said prior assignment field may be assigned to the sector which continued physically per ECC block.

[0063] Said file management information may also include the positional information which shows said real-time extent.

[0064] Said file management information may also contain the 1st identification information which shows whether it is a real-time file containing said real-time data.

[0065] Said file management information may also contain the 2nd identification information which shows that arrangement of said real-time extent is arranged according to said real-time playback conditions.

[0066] Said file management field may also include the information showing the conditions by which said real-time extent has been arranged as an extended attribute.

[0067] It is the record approach which carries out additional record of the real-time file which contains said real-time data so that said real-time data may continue and may be reproduced, when a playback standard model reproduces real-time data at an information record medium. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least one or more real-time extents assigned to the sector which continued logically in said volume space. The step which reads the data which consist of one or more GOP(s) recorded on the real-time end of file before said real-time data's being data compressed by the MPEG method and carrying out additional record, The step which re-encodes said read data, and the step which records said re-encoded data into the newly assigned prior assignment field, The step which records the real-time data which newly carry out additional record into

said prior assignment field, and the step which records said file management information are included, and the above-mentioned purpose is attained by that.

[0068] Said prior assignment field may be assigned to the sector which continued physically per ECC block.

[0069] Said file management information may also include the positional information which shows said real-time extent.

[0070] Said file management information may also contain the 1st identification information which shows whether it is a real-time file containing said real-time data.

[0071] Said file management information may also contain the 2nd identification information which shows that arrangement of said real-time extent is arranged according to said real-time playback conditions.

[0072] Said file management field may also include the information showing the conditions by which said real-time extent has been arranged as an extended attribute.

[0073] The record approach of others [pan / concerning this invention] is the record approach which records information on the information record medium equipped with the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. The step which judges whether it is the real-time file whose file contains real-time data, The step which records said file management information on said volume space, and when it is judged with said file being a real-time file When the undershirt run of a buffer occurs during the step which continues and records said real-time data on a linking loss extent, and record of said real-time data The step which forms a linking gap in the real-time extent on which said real-time data are recorded is included, and the above-mentioned purpose is attained by that.

[0074] Said linking loss extent may also include one ECC block.

[0075] Said file management information may also include the positional information which shows said real-time extent.

[0076] Said file management field may also contain the identification information which shows whether it is a real-time file containing said real-time data.

[0077] In order to identify said linking loss extent, when the following sector is contained in said linking loss extent except for a linking sector to the field which records the physical additional information of the sector in said linking loss extent, the data-type bit of the sector may include further the step set as 1.

[0078] The step which records said real-time data in the runout area in said linking loss extent may be included further.

[0079] When a playback standard model reproduces real-time data, the information recording apparatus concerning this invention It is the information recording device which records the real-time file which contains said real-time data so that said real-time data may be reproduced continuously on an information record medium. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. From the free space of the plurality in said volume space which continued logically, the field which fulfills the following real-time playback conditions as a prior assignment field Allocation, Said real-time data and said file management information are recorded, and it has a file system processing means to create said file management information for managing said real-time data as said real-time file. Here Said i+1st prior assignment fields fill real-time playback condition $T(i) <= (B(i-1)+D(i))/Vout$. T (i) : as the time amount which said pickup accesses from said i-th prior assignment end-of-region edge at the head of said i+1st prior assignment fields, and $B(i) = B(i-1)+D(i)-VoutxT(i)$:$B(0) = 0$ The amount of data accumulated into said buffer memory when said pickup accesses at the head of the i+1st prior assignment fields from said i-th prior assignment end-of-region edge, $D(i) = (Vin-Vout)xS(i)/Vin$: The augend of the data stored into said buffer memory when said pickup reads said prior assignment field from said i-th prior assignment field, Size of said buffer

memory is set to M. At least at the time of D(i) >M-B (i-1) however, D (i) it amends below to M-B (i-1) -- having -- Vout: -- a data rate in case said real-time data are passed through and transmitted to said decode module from said buffer memory -- Vin: It considers as the data rate when said pickup reading said real-time data from said prior assignment field, and transmitting to said buffer memory, and the data size of said S(i):i position prior assignment field, and the above-mentioned purpose is attained by that.

[0080] D (i) is amended with D(i) =(Vin-Vout)xS(i)/Vin+B(i-1)-kx (VoutxTk) at the time of D(i) >M-B (i-1). Here Tk: It is good also as the maximum rotational delay of said information record medium, and integer part of k: (D(i)+B(i-1)-M) (/(VoutxTk) +1).

[0081] Said prior assignment field may be assigned to the sector which continued physically per ECC block.

[0082] Said file management information may also include the positional information which shows said real-time extent.

[0083] Said file management information may also contain the 1st identification information which shows whether it is a real-time file containing said real-time data.

[0084] Said file management information may also contain the 2nd identification information which shows that arrangement of said real-time extent is arranged according to said real-time playback conditions.

[0085] Said file management information may also include the information showing the conditions by which said real-time extent has been arranged as an extended attribute.

[0086] When a playback standard model reproduces real-time data, other information recording apparatus concerning this invention It is the information recording device which carries out additional record of the real-time file which contains said real-time data so that said real-time data may be reproduced continuously at an information record medium. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes

said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least one or more real-time extents assigned to the sector which continued logically in said volume space. It calculates whether the amount of data accumulated into said buffer memory when a playback standard model reproduces said real-time extent causes overflow. In causing said overflow, while amending the amount of data accumulated in said buffer memory below in the size of said buffer memory It calculates whether the amount of data accumulated into said buffer memory when a playback standard model accesses to the prior assignment field newly assigned from said real-time extent causes an underflow. An amount-of-data count means to search said real-time extent which does not cause an underflow in access to said prior assignment field in causing said underflow, The real-time data already recorded on the real-time extent which causes said underflow It has further a data-logging means to record into said prior assignment field newly assigned, and to record the newly added real-time data into said prior assignment field, and the file structure processing means which creates and records said file management information, and the above-mentioned purpose is attained by that.

[0087] Said prior assignment field may be assigned to the sector which continued physically per ECC block.

[0088] Said file management information may also include the positional information which shows said real-time extent.

[0089] Said file management information may also contain the 1st identification information which shows whether it is a real-time file containing said real-time data.

[0090] Said file management information may also contain the 2nd identification information which shows that arrangement of said real-time extent is arranged according to said real-time playback conditions.

[0091] Said file management information may also include the information showing the conditions by which said real-time extent has been arranged as an extended attribute.

[0092] When, as for other information recording apparatus, a playback standard model reproduces real-time data to the pan concerning this invention It is the information recording device which carries out additional record of the real-time file which contains said real-time data so that said real-time data may be reproduced continuously at an information record medium. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least one or more real-time extents assigned to the sector which continued logically in said volume space. Said real-time data are data compressed by the MPEG method. A re-encoding means to record into the prior assignment field which read the data which consist of one or more GOP(s) recorded on the real-time end of file before carrying out additional record, re-encoded said read data, and was newly assigned, It has further the file structure processing means which creates and records said file management information, and the above-mentioned purpose is attained by that.

[0093] Said prior assignment field may be assigned to the sector which continued physically per ECC block.

[0094] Said file management information may also include the positional information which shows said real-time extent.

[0095] Said file management information may also contain the 1st identification information which shows whether it is a real-time file containing said real-time data.

[0096] Said file management information may also contain the 2nd identification information which shows that arrangement of said real-time extent is arranged according to said real-time playback conditions.

[0097] Said file management information may also include the information showing the conditions by which said real-time extent has been arranged as

an extended attribute.

[0098] The information recording apparatus of others [pan / concerning this invention] is an information recording apparatus which records information on the information record medium equipped with the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. A recording-mode setting means to judge whether it is the real-time file whose file contains real-time data, A file structure processing means to record said file management information on said volume space, and when it is judged with said file being a real-time file When the undershirt run of a buffer occurs during a linking setting means to continue and record said real-time data on a linking loss extent, and record of said real-time data It has the linking control section which forms a linking gap in the real-time extent on which said real-time data are recorded, and the above-mentioned purpose is attained by that.

[0099] Said linking loss extent may also include one ECC block.

[0100] Said file management information may also include the positional information which shows said real-time extent.

[0101] Said file management information may also contain the identification information which shows whether it is a real-time file containing said real-time data.

[0102] In order to identify said linking loss extent, when the following sector is contained in said linking loss extent except for a linking sector to the field which records the physical additional information of the sector in said linking loss extent, the data-type bit of the sector may be further equipped with the linking control section set as 1.

[0103] You may have further the runout control section which records said real-time data in the runout area in said linking loss extent.

[0104] When a playback standard model reproduces real-time data, the system control section concerning this invention It is the system control section of the information recording device which records the real-time file which contains said real-time data so that said real-time data may be reproduced continuously on an information record medium. Said real-time data contain one [at least] data of image data and voice data. Said playback

standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. From the free space of the plurality in said volume space which continued logically, the field which fulfills the following real-time playback conditions as a prior assignment field Allocation, Said real-time data and said file management information are recorded, and it has a file system processing means to create said file management information for managing said real-time data as said real-time file. Here Said i+1st prior assignment fields fill real-time playback condition T(i) <=(B(i-1)+D (i))/Vout. T (i) : as the time amount which said pickup accesses from said i-th prior assignment end-of-region edge at the head of said i+1st prior assignment fields, and B(i) =B(i-1)+D(i)-VoutxT(i):B(0) =0 The amount of data accumulated into said buffer memory when said pickup accesses at the head of the i+1st prior assignment fields from said i-th prior assignment end-of-region edge, D(i) =(Vin-Vout)xS (i)/Vin : The augend of the data stored into said buffer memory when said pickup reads said prior assignment field from said i-th prior assignment field, Size of said buffer memory is set to M. At least at the time of D(i) >M-B (i-1) however, D (i) it amends below to M-B (i-1) -- having -- Vout: -- a data rate in case said real-time data are passed through and transmitted to said decode module from said buffer memory -- Vin: It considers as the data rate when said pickup reading said real-time data from said prior assignment field, and transmitting to said buffer memory, and the data size of said S(i):i position prior assignment field, and the above-mentioned purpose is attained by that. [0105] When a playback standard model reproduces real-time data, the alien-system control section concerning this invention It is the system control section of the information recording device which carries out additional record of the real-time file which contains said real-time data so that said real-time data may be reproduced continuously at an information record medium. Said real-time data contain one [at least] data of image data and voice data. Said

playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least one or more real-time extents assigned to the sector which continued logically in said volume space. It calculates whether the amount of data accumulated into said buffer memory when a playback standard model reproduces said real-time extent causes overflow. In causing said overflow, while amending the amount of data accumulated in said buffer memory below in the size of said buffer memory It calculates whether the amount of data accumulated into said buffer memory when a playback standard model accesses to the prior assignment field newly assigned from said real-time extent causes an underflow. An amount-of-data count means to search said real-time extent which does not cause an underflow in access to said prior assignment field in causing said underflow, The real-time data already recorded on the real-time extent which causes said underflow It has further a data-logging means to record into said prior assignment field newly assigned, and to record the newly added real-time data into said prior assignment field, and the file structure processing means which creates and records said file management information, and the above-mentioned purpose is attained by that.

[0106] When a playback standard model reproduces real-time data, the playback approach concerning this invention It is the playback approach which reproduces data from the information record medium with which the real-time file which contains said real-time data so that said real-time data may be reproduced continuously was recorded. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information

record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least two or more real-time extents assigned to the sector which continued logically in said volume space. Said i+1st real-time extents It is arranged in the location which fills real-time playback condition T(i) <=(B(i-1)+D (i))/Vout. Here T (i) : The time amount which said pickup accesses from the termination of said i-th real-time extent at the head of said i+1st real-time extents, As B(i) =B(i-1)+D(i)-VoutxT(i):B(0) =0 Said pickup from the termination of said i-th real-time extent The amount of data accumulated into said buffer memory when it accesses at the head of the i+1st real-time extents, D(i) =(Vin-Vout)xS(i)/Vin: -- the augend of the data stored into said buffer memory when said pickup reads said real-time data from an account of No. i impending real-time extent -- however Size of said buffer memory is set to M. At least at the time of D(i) >M-B (i-1) D (i) it amends below to M-B (i-1) -- having -- Vout: -- a data rate in case said real-time data are passed through and transmitted to said decode module from said buffer memory -- Vin : The data rate when said pickup reading said real-time data from said real-time extent, and transmitting to said buffer memory, S(i): The data size of said i position real-time extent, The step which recognizes that carry out, acquire the positional information of a real-time extent, and said real-time extent is arranged according to real-time playback conditions, The step which reads data from said real-time extent with the data rate more than Vin of a playback standard model, The step which carries out the temporary storage of said read real-time data to said buffer memory, It has the step which reads the data stored in said buffer memory, and is decoded by the decoder, and the step accessed to the following real-time extent within access-time T (i) of a playback standard model, and the above-mentioned purpose is attained by that.

[0107] Said file management field may include further the step which notifies a playback mode for the parameter of allocation of a play back reference model to an optical disk drive beforehand before reproducing, read-out and from the management domain of said real-time file including the information showing the conditions by which said real-time extent has been arranged as an

extended attribute.

[0108] Other playback approaches concerning this invention from an information record medium equipped with the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector Are the playback approach which reproduces real-time data, and said data contain real-time data. Said real-time data contain one [at least] data of image data and voice data. Said real-time data are recorded on at least one or more real-time extents assigned to the sector which continued logically in said volume space. Said file consists of at least one or more real-time extents. A linking loss extent is arranged in front of said real-time extent. The step which judges whether it is the real-time file said whose file a linking gap is formed in said real-time extent, and contains real-time data, In playback actuation of the data from said real-time extent The step which performs continuous data playback actuation, without performing recovery processing even if the playback error by the invalid data recorded on said linking gap occurs is included, and the above-mentioned purpose is attained by that.

[0109] When a playback standard model reproduces real-time data, the information regenerative apparatus concerning this invention It is the information regenerative apparatus which reproduces data from the information record medium with which the real-time file which contains said real-time data so that said real-time data may be reproduced continuously was recorded. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least two or more real-time extents assigned to the sector which continued logically in said volume space. Said i+1st real-time extents It is arranged in the location which fills real-time playback condition T(i) <=(B(i-1)+D (i))/Vout.

Here T (i) : The time amount which said pickup accesses from the termination of said i-th real-time extent at the head of said i+1st real-time extents, As B(i) =B(i-1)+D(i)-VoutxT(i):B(0) =0 Said pickup from the termination of said i-th real-time extent The amount of data accumulated into said buffer memory when it accesses at the head of the i+1st real-time extents, D(i) =(Vin-Vout)xS(i)/Vin: -- the augend of the data stored into said buffer memory when said pickup reads said real-time data from an account of No. i impending real-time extent -- however Size of said buffer memory is set to M. At least at the time of D(i) >M-B (i-1) D (i) it amends below to M-B (i-1) -- having -- Vout: -- a data rate in case said real-time data are passed through and transmitted to said decode module from said buffer memory -- Vin : The data rate when said pickup reading said real-time data from said real-time extent, and transmitting to said buffer memory, It considers as the data size of said S(i):i position real-time extent. Said information regenerative apparatus A file structure processing means to recognize that acquire the positional information of a real-time extent and said real-time extent is arranged according to real-time playback conditions, The data playback section which reads data from said real-time extent with a predetermined data rate, The buffer memory which carries out the temporary storage of said read real-time data, It has a decoder for reading and decoding the data stored in said buffer memory. The data reproducibility ability realized with the access engine performance of said data playback section, a data read-out rate, and the size of said buffer memory The engine performance which can reproduce data continuously from the real-time extent recorded according to said real-time playback conditions is filled, and the above-mentioned purpose is attained by that.

[0110] Said file structure processing means may be further equipped with a notice means of a playback mode to notify a playback mode for the parameter of allocation of a play back reference model to an optical disk drive beforehand before reproducing, read-out and, from the management domain of said real-time file including the information showing the conditions by which said real-time extent has been arranged as an extended attribute.

[0111] When a playback standard model reproduces real-time data, other information regenerative apparatus concerning this invention It is the

information regenerative apparatus which reproduces data from the information record medium with which the real-time file which contains said real-time data so that said real-time data may be reproduced continuously was recorded. Said real-time data contain one [at least] data of image data and voice data. Said playback standard model The pickup which reads said real-time data from said information record medium, and the buffer memory which holds temporarily said real-time data read by said pickup, The decode module which reads and processes said real-time data from said buffer memory is included. Said information record medium It has the volume space for recording at least the file management information for managing the data recorded as a file, and said file per sector. Said real-time data are recorded on at least two or more real-time extents assigned to the sector which continued logically in said volume space. Said i+1st real-time extents It is arranged in the location which fills real-time playback condition T(i) <=(B(i-1)+D (i))/Vout. Here T (i) : The time amount which said pickup accesses from the termination of said i-th real-time extent at the head of said i+1st real-time extents, As B(i) =B(i-1)+D(i)-VoutxT(i):B(0) =0 Said pickup from the termination of said i-th real-time extent The amount of data accumulated into said buffer memory when it accesses at the head of the i+1st real-time extents, D(i) =(Vin-Vout)xS(i)/Vin: -- the augend of the data stored into said buffer memory when said pickup reads said real-time data from an account of No. i impending real-time extent -- however Size of said buffer memory is set to M. At least at the time of D(i) >M-B (i-1) D (i) it amends below to M-B (i-1) -- having -- Vout: -- a data rate in case said real-time data are passed through and transmitted to said decode module from said buffer memory -- Vin : The data rate when said pickup reading said real-time data from said real-time extent, and transmitting to said buffer memory, S(i): A file structure processing means to judge whether it is the real-time file whose file consider as the data size of said i position real-time extent, and contains real-time data, In playback actuation of the data from said real-time extent It has the data playback section which performs continuous data playback actuation, without performing recovery processing even if the playback error by the invalid data recorded on said linking gap occurs, and the above-mentioned purpose is attained by that.

[0112] Various kinds of playback devices can carry out continuation playback of the real-time data from the information record medium of this invention by the information record medium of this invention introducing a playback standard model so that a regenerative apparatus can reproduce real-time data continuously, and arranging a real-time extent on an information record medium using real-time playback conditions.

[0113] Moreover, the underflow which generates a real-time extent by [which continued physically] setting up for every field at the time of access can be calculated more correctly.

[0114] Moreover, by establishing the field which records the information for identifying a real-time file and a general file in a file management information field, even if an error occurs at the time of playback of a real-time file, continuation playback can be carried out more effectively.

[0115] Moreover, it can judge [whether the regenerative apparatus which fills the engine performance of a playback standard model can reproduce a real-time file continuously from the information record medium of this invention, and] by preparing the information which shows that it has been arranged so that a real-time extent may fulfill real-time playback conditions in a file management information field.

[0116] Moreover, even if the information record medium of this invention is the case where additional record of the real-time data is newly carried out to the real-time file recorded beforehand, it can reproduce data continuously from the head of a real-time file where additional record of the regenerative apparatus was carried out by arranging a real-time extent on an information record medium using real-time playback conditions.

[0117] Moreover, even if the data by which additional record is carried out are real-time data encoded by the MPEG method, a regenerative apparatus can reproduce data continuously by establishing again the field which re-encodes VOBU and records it in the newly assigned non-record section.

[0118] Moreover, even when it is the optical disk with which data are recorded using a linking scheme like a DVD-R disk, the information record medium of this invention can record real-time data on the continuous field, even if it causes the undershirt run of a buffer, when a recording apparatus records

real-time data by arranging a real-time extent behind a linking loss extent, and forming a linking gap in a real-time extent. Moreover, dependability of the data in the head section of real-time data can be made high by arranging a real-time extent behind a linking loss extent.

[0119] Moreover, dependability of the data in the head section of real-time data can be made still higher by considering size of a linking loss extent as 1ECC block.

[0120] Moreover, since it can recognize that a regenerative apparatus is the sector on which unnecessary data were recorded even if it detected the linking gap by establishing the field which records the information for identifying a linking loss extent in the field for recording the physical additional information of a sector, the design of a regenerative apparatus becomes easy.

[0121] Moreover, since the field which cannot record data is limited to a linking gap even if it causes the undershirt run of a buffer, when a TA recording apparatus records real-time data by recording data effective in runout area, dependability of real-time data can be made high.

[0122] Moreover, the record approach of this invention can realize retrieval and allocation of the real-time extent which realizes continuation playback of real-time data by calculating the amount of data in the buffer memory at the time of playback.

[0123] After a playback standard model calculates beforehand the field from which overflow of a buffer and an underflow are not started, as for the record approach of this invention, various kinds of playback devices can record data by recording real-time data as the continuation playback of the real-time data can be carried out.

[0124] Moreover, even if it is the case where additional record of the real-time data is newly carried out to the real-time file recorded beforehand, when it turns out that a playback standard model causes the underflow of a buffer, data can be recorded by copying the real-time data recorded on the field leading to an underflow in a non-record section as a playback device can carry out continuation playback of the real-time data.

[0125] Moreover, even if the data by which additional record is carried out are real-time data encoded by the MPEG method, seamless playback of an

MPEG stream is also realizable by re-encoding VOBU of the last of already recorded AV data, and recording it with AV data by which additional record is newly carried out.

[0126] Moreover, the record approach of this invention of this invention can offer the record approach also with that suitable in the case of being the optical disk with which data are recorded using a linking scheme. For example, since the information on I picture is recorded on the top sector, MPEG data influence greatly the image by which the data quality of a top sector is reproduced, and audio quality. As for the data quality of a head sector, in the audio data of the quality of loud sound, the impression of the beginning of music is influenced similarly. For this reason, when recording real-time data, the dependability of data is required of a head sector.

[0127] On the other hand, when the image and voice data recorded in an extent compare a frieze of the image by lack and access of data, or voice, the frieze of an image or voice is easy to be recognized rather than degradation of the playback image by lack of data, or audio image quality and tone quality for a user. for this reason, as for the real-time data boiled and recorded in an extent, continuation record and continuation playback are required.

[0128] By the record approach of this invention, since a head sector is recordable after a linking loss extent, a linking sector is not formed and it can secure the dependability of data. Moreover, since a linking loss extent is not formed at every undershirt run of a buffer, real-time data are continuously recordable.

[0129] Moreover, since a linking gap is about several bytes, the error correction of the data which were not able to be recorded because of the linking gap can be easily carried out by ECC.

[0130] Moreover, even if the undershirt run of a buffer occurs at the time of record, two or more linking loss fields are not formed, and recording efficiency is good. Furthermore, address information of each real-time extent managed with a file system can also be made small.

[0131] Moreover, using file classification information, in order to change the read-out command for General data, and the read-out command for real-time data, even if a defective sector is detected at the time of read-out of real-time

data, the playback approach of this invention can continue continuation playback, and can perform it.

[0132] Moreover, the information regenerative apparatus of this invention can realize continuation playback between information regenerative apparatus with the same engine performance, when the access engine performance of a playback drive and the data readout engine performance, and the data reproducibility ability realized with the size of the buffer memory for playback are filling the data reproducibility ability which a playback standard model specifies.

[0133]

[Embodiment of the Invention] Hereafter, it explains, referring to a drawing about the gestalt of operation of this invention.

[0134] The gestalt 1 of operation is a gestalt of operation in case a real-time file is newly recorded on a DVD-RAM disk, and the gestalt 2 of operation is a gestalt of operation in the case of newly carrying out additional record of the real-time data to the real-time file already recorded on the DVD-R disk.

[0135] (Gestalt 1 of operation) The playback standard model and access engine performance which are indicated to be the field configuration of the information record medium with which the file managed according to the volume file structure specified as a procedure of explanation by ECMA167 specification first shown in drawing 1 is recorded to drawing 2 are explained. Next, how to record a real-time file on the information record medium shown in drawing 1 using the flow chart shown in the block configuration and drawing 4 of the information record regenerative apparatus shown in drawing 3 is explained. How to reproduce a real-time file from the information record medium shown in drawing 1 is explained using the flow chart finally shown in the block configuration and drawing 8 of the information record regenerative apparatus shown in drawing 3 .

[0136] In addition, in the following explanation, unless various descriptors, pointers, etc. which are recorded on an information record medium as a volume file structure have a detailed publication especially, the DS based on ECMA167 specification shall be used.

[0137] Drawing 1 is the data structure diagram showing the field configuration

of the information record medium which is a rewriting mold optical disk in the gestalt of 1 operation of this invention. In drawing 1 , although the information field which consists of physical sectors is not illustrating the lead-in groove field 101, the DMA field 102, and all zones, it consists of a zone 0 to a zone 34, and a lead-out field 126. The spare field 103 for carrying out alternative record of a defective sector or the defective block is arranged, and volume space is formed in the head of a zone 0 from the field which follows. The volume structure field 104 for recording the volume structure for treating an information record medium logically from the head of this volume space and the file structure field 105 where the file structure was recorded are formed.

[0138] The assigned fields 106, 110, 120, 121, 122, and 125 are fields where data are already recorded, between a zone 0 and a zone 1 and between a zone 1 and a zone 2, the guard fields 107 and 109 where user data are not recorded are formed, and although not illustrated, the assigned fields 120, 122, and 125 include the guard field formed in the boundary of a zone. The real-time extents RT1 and RT2 on which real-time data were recorded are formed in the zone 1 on both sides of the defective block 108. A defective block 108 is a defective block detected while recording common data, and alternative record of the data is carried out all over the spare field 103. The real-time extents RT3 and RT4 are formed in a zone 2, and prior assignment field A5 and the real-time extent RT 5 are formed in the zone 3.

[0139] The real-time extent RT 6, the empty extent 123, and the non-record section 124 are formed in the zone 7. Although RT6 mentions later from the real-time extent RT 1, it is arranged so that the conditions specified with a playback standard model with the predetermined access engine performance may be fulfilled. Moreover, when real-time data are recorded on this field, in order that continuation playback of data may interrupt prior assignment field A5, real-time data are not recorded on this field. The management information of a file with the directory structure shown in the tooth-space bit map 141 and drawing 17 for managing the non-assigned field in which the record in volume space is possible is recorded on the file structure field 105.

[0140] A file entry 142 is the management information for managing the positional information and attribute information on a root directory 201, and a

root directory file consists of a file identification descriptor 143,144. The file identification descriptor 143,144 has the positional information of the file entry 145,146 of the FILEA.DAT file 204 created under the root directory 201, respectively, and the REALTIME directory 202. A file entry 145 has the positional information of the assigned field 106 where the data of this file were recorded. A file entry 146 has the positional information of the REALTIME directory file which consists of file identification descriptors 147. The file identification descriptor 147 has the positional information of the file entry 148 of the VIDEO.VRO file 203 created under the REALTIME directory 202. A file entry 148 has the positional information of RT6 and the empty extent 123 from the real-time extent RT 1 on which real-time data were recorded.

[0141] Drawing 2 is drawing showing the playback standard model and its access engine performance for deciding the arrangement conditions of the real-time data in the gestalt of 1 operation of this invention. The playback standard model shown in drawing 2 (a) consists of a decode module 304 for decoding the data transmitted from the pickup 302 which reads data from a disk 301 and a disk, the buffer memory 303 which saves the read data temporarily, and buffer memory 303. Vin is a data rate when transmitting data to buffer memory 303 from a disk 301. Vout is a data rate when transmitting data to the decode module 304 from buffer memory 303. Moreover, a bigger value than the maximum data rate Vout of the real-time data with which application assumes Vin is set up.

[0142] Drawing 2 (b) is drawing showing access distance in case the pickup 302 of a playback standard model accesses, and the relation of the access time. ip (x) is a function which shows the integral part of x, and skip access which carries out the unit of single sector latency-time TS is adapted as n=ip (TI/TS) at the time of access to n sector. Fixed time TZ is adapted and, as for access over a zone boundary, fixed time TI is adapted, as for access to the location of the arbitration in the same zone. As for access to the location of arbitration, TN= (2 TI+TZ) is adapted in an adjoining zone. As for access to the location of the arbitration in the zone distant two or more, the fixed value TL is adapted as the full stroke access time from the most inner circumference to the outermost periphery.

[0143] Even if a playback machine various type reproduces the real-time data on an optical disk, this playback standard model is made in order to decide reproducible conditions continuously. For this reason, the format and the access time of the concrete access engine performance for which it opts by drawing 2 (b) are determined from the access time which can carry out various kinds of playback machines with which playing this optical disk is assumed. For example, the access time becomes [the direction of the noncommercial portable player as which actuation by power saving is required] long when the drive for computers is compared with a noncommercial portable player. In such a case, as for the access engine performance for which it opts by drawing 2 (b), the access time of a noncommercial portable player is adapted.

[0144] In a playback standard model, when reading data, into buffer memory, data are stored at the rate of Vin-Vout, and since read-out of data cannot be performed when pickup accesses, the data in a buffer are consumed at the rate of Vout. Transition of the amount of data in the buffer memory 303 when a playback standard model reproduces real-time data is quantitatively calculable to this model of operation using the value of the concrete access time. Therefore, if the record section of data is arranged so that the data in buffer memory 303 may not cause an underflow when a playback standard model reproduces real-time data, real-time data can be reproduced continuously. The arrangement conditions of a real-time extent that real-time data are recorded by this modeling are specified.

[0145] Next, how to record a real-time file on the information record medium shown in drawing 1 using the block configuration and flow chart of an information record regenerative apparatus of this invention which are shown in drawing 3 and drawing 4 , respectively is explained. [of one example] An information record regenerative apparatus consists of the input means 708, such as the system control section 701, I/O bus 706, the optical disk drive 707, and a recording mode, the tuner 710 which receives TV broadcast, an encoder 709 which encodes an image and an acoustic signal to an audio video data (AV data are called below), and a decoder 711 which decodes AV data and is outputted to TV712. The system control section 701 consists of

the recording-mode setting means 702, the memory 703 for allocation parameters, a file system processing means 704, and memory 705 for file system processing. The file system processing means 704 consists of the notice means 741 of a playback mode, the amount-of-data count means 742, the hour entry count means 743, the non-assigned field retrieval means 744, the physical discontinuity reference-by-location speciality stage 745, the file structure processing means 746, a data-logging means 747, and a data readout means 748. The memory 705 for file system processing which these means use consists of the memory 751 for empty extents, the memory 752 for hour entries, the memory 753 for prior assignment fields, the memory 754 for physical discontinuity locations, the memory 755 for file structures, memory 756 for bit maps, and buffer memory 757 for data.

[0146] In addition, the record engine performance realized when the data-logging engine performance realized with the access engine performance of the optical disk drive 707, and the record rate at the time of data logging and the size of the buffer memory 757 for data uses a playback standard model for record is filled.

[0147] A recording mode and chart lasting time are directed from the input means 708, such as remote control, a mouse, and a keyboard. The data which record the recording-mode decision means 702 first judge whether it is AV data, and the following steps are performed at the time of AV data. The recording-mode decision means 702 determines the size SR, the buffer size Bmax, and various kinds of access times of Vout which makes this value a fixed value, the read-out rate Vin from a disk, and the data which should be recorded, in order to make record possible, even if the maximum data rate of the data to record continues, and it holds them to the memory 703 for allocation parameters. Here, in order that the real-time data recorded on a DVD-RAM disk may clarify the conditions of refreshable equipment, the fixed value defined beforehand is already held as the read-out rate Vin and buffer size Bmax at the memory 703 for allocation parameters. Moreover, as for these fixed values, two or more combination is set up corresponding to improvement in the speed of a read-out drive. The read-out rate Vin can specify the maximum data rate of the data which a user records depending on

the data to record. For example, a small value is set up when a value with the big read-out rate Vin is set up when recording in high-definition mode, and recording in the mode for a long time. (Step S801)

While directing the file structure processing means 746 for the data readout means 748 so that the volume structure field 104 and the file structure field 105 may be read, the data read from the optical disk drive 707 are analyzed on the memory 755 for file structures. A tooth-space bit map is transmitted to the memory 756 for bit maps among the read data. It is directed to the optical disk drive 707 that the physical discontinuity reference-by-location speciality stage 745 reports the positional information of the defective sector registered into the positional information of a zone boundary, or PDL and SDL, or a defective block as physical discontinuity positional information on a disk. The physical discontinuity positional information reported from the optical disk drive 707 is held to the memory 754 for physical discontinuity locations.

[0148] The non-assigned field retrieval means 744 searches the non-assigned field which continued physically per ECC block as a prior assignment field using the positional information of the non-assigned field held at the memory 756 for bit maps, and the physical discontinuity positional information held at the memory 754 for physical discontinuity locations. The positional information of the searched prior assignment field is saved to the memory 753 for prior assignment fields. This retrieval actuation is performed until the sum total size of a prior assignment field fully exceeds the size SR of the data which were determined at step S801 and which should be recorded. Even if the field which cannot be assigned at subsequent steps is found by carrying out like this, it is not necessary to perform this step again.

[0149] Drawing 5 (a) is drawing showing arrangement of the prior assignment field searched with this step. From the prior assignment field A1 to A7 is assigned. In order to secure a prior assignment field, the file structure processing means 746 updates a prior assignment field among the bit maps on the memory 756 for bit maps to allocation end.

[0150] Here, the field except the field registered into SDL among the recordable fields searched by the tooth-space bit map turns into a recordable field which continued logically. The field registered into SDL is because

alternative record of the data is carried out to a spare field in fact. Moreover, the field which continued physically can be decided by dividing these fields that continued logically on the boundary of the guard field in a zone, or the field registered into PDL. The reason for searching the field which continued physically is for calculating more transition of the amount of data in the buffer calculated at subsequent steps to accuracy.

[0151] Moreover, the reason searched per ECC block is for defective management protecting being substituted for real-time data, when real-time data and common data are recorded on one ECC block. (Step S802)

The positional information of the prior assignment field where the hour entry count means 743 was saved in the memory 753 for prior assignment fields, The read time TRi (i supports the field number Ai of the prior assignment field shown in drawing 5 (a)) when reading each prior assignment field with a data rate Vin using various kinds of access times saved in the memory 703 for allocation parameters, Access-time Ti between prior assignment fields and i+1 (the prior assignment field Ai shown in drawing 5 (a) and access time between Ai+1) are calculated. Here, a read time TRi is found as Si/Vin by setting size of each prior assignment field to Si.

[0152] In drawing 5 (a), a read time TR1 to TR7 is time amount which reads A7 from the prior assignment field A1, respectively. moreover, access-time T - - 1 and 2 are the read-out time delays by defective ECC block, and they are 16TS. T -- 2, 3, T3, 4, T four, 5, and T -- 5 and 6T -- 6 and 7 are access-time TZ of a zone boundary, access-time TI in a zone, adjoining zone access-time TN, access-time TI in a zone, and long access-time TL, respectively. These access times are found from the access engine performance of the playback standard model shown in drawing 2 (b). In order that a playback standard model may calculate the situation when reproducing data from a prior assignment field, the read time of each prior assignment field and the access time to the next prior assignment field are calculated by turns. (Step S803)

Next, the amount-of-data count means 742 performs data processing from step S804 to S813 using the read time and the access time which were held at the memory 752 for hour entries. The amount of data in the buffer memory at the time of read-out termination of a prior assignment field is calculated.

Drawing 6 shows transition of the amount of data in the buffer memory at the time of reading the data of a prior assignment field. In the time amount t1 after reading the prior assignment field A1, the amount of data is increasing with the data rate of (Vin-Vout) between TR1. (Step S804)

Since the buffer memory of an actual playback machine is limited, it is necessary to take into consideration actuation in the upper limit of buffer size. For this reason, it is confirmed whether the calculated amount of data exceeds buffer size Bmax. (Step S805)

When not overflowing next, it is confirmed whether the total size of the calculated prior assignment field exceeds enough the size SR of the data which were beforehand set up at step S801 and which should be recorded. Even if it avoids and records the field which can record data neither by the contaminant nor the blemish by assigning sufficient recordable field as a prior assignment field at the time of actual record, recordable fields do not run short. (Step S807)

When the total size of the calculated prior assignment field does not exceed SR next, it is confirmed whether the calculated amount of data exceeds the allocation level BL (=VoutxTL). When the amount of data in a buffer exceeds BL, an underflow is not caused even if it accesses which field on a disk from this prior assignment end-of-region edge. For this reason, from a top prior assignment field to this prior assignment field is decided as a field from which an underflow is not started, and these fields are registered as an empty extent which can record real-time data. The efficiency of subsequent steps can be increased by carrying out like this. For example, when looking for the field resulting from an underflow, it can search except for the field registered as an empty extent. (Step S809)

Next, the amount of data in the buffer memory at the time of read-out initiation of a prior assignment field is calculated. In the time amount t2 before reading the prior assignment field A2 of drawing 4 , the amount of data decreases with the data rate of Vout between T1 and 2. (Step S811)

It is checked being subtracted for the calculated amount of data. When the amount of data is subtracted, a buffer means that a lifting and playback data interrupt an underflow by this access. (Step S812)

When it is not subtracted, it goes to the head of step S804. In drawing 6 , when from the prior assignment field A2 to A4 repeats S812 from step S804, it is calculated.

[0153] In step S805, as shown in drawing 4 , data overflow by the posterior part of prior assignment field A4. In this case, in order to avoid overflow, in order that the optical disk drive 707 may interrupt data playback actuation temporarily, necessary minimum rotational delay is added to TR4. For this reason, the amount of data calculated as that to which data decreased in number with the data rate Vout between kxTK is amended. In addition, TK is the rotational delay in the outermost periphery, sets the amount of data when overflowing to B (t), and k is expressed with k=ip (B(t)-Bmax) (/(VoutxTK) +1). ip (x) is a function which shows the integer part of x here. In addition, in order to simplify count, in amendment of this amount of data, it is good also considering the amount of data when overflowing as Bmax. However, the precision of count becomes low in this case. (Step S806)

In time of day t7, since the amount of data exceeds the allocation level BL, as shown in drawing 5 (a), the prior assignment field A1 to A4 is assigned as E4 from the empty extent E1, and the positional information is stored in the memory 751 for empty extents. (Step S810)

In drawing 6 , the count result of the amount of data in the case of reading A7 from prior assignment field A5 is shown by the dotted line. In time of day t12, data cause an underflow. In this case, the prior assignment field which has contributed to the underflow most is excepted from the candidate for allocation, and it goes to the head of step S811. The prior assignment field which has contributed to the underflow most can be judged by the next Di. Di is the decrement of the data which will decrease in number by the time it accesses at the head of the prior assignment field Ai and ends read-out of data from this field, and calculates this decrement for every prior assignment field. The prior assignment field where this decrement is the biggest is a prior assignment field which has contributed to the underflow of data most.

[0154] D5, D6, and D7 which are shown in drawing 4 are specifically calculated, and since D5 is the largest, prior assignment field A5 is excepted from the candidate for allocation. That is, in drawing 5 (b), a field number is

updated for the prior assignment fields A6 and A7 as A5* and A6*, respectively. Furthermore, as shown in drawing 4 and drawing 5 (b), access-time T four between prior assignment field A4 and A5* and 5* are calculated, read times TR6 and TR7 are made into TR5* and TR6*, respectively, and seven are made into the access time T6,T5, and 6*. Since this approach is taking access into consideration sequentially from the field where the size of a prior assignment field is small compared with the approach of deleting from count, its count effectiveness is good. Moreover, even if it deletes the field where a decrement is the biggest from count, when an underflow breaks out, a decrement repeats next the procedure of deleting a big field from count. (Step S813)

Next, count of step S811 is resumed from T four and 5*. Since the total size of a prior assignment field field becomes more than the data size SR which should be recorded after calculating the increment in the amount of data to prior assignment field A6*, the positional information is stored in the memory 751 for allocation empty extents as empty extents E5 and E6, respectively, and it goes prior assignment field A5* and A6* to step S814. The field which can record real-time data is called for at the step so far. (Step S808)

In order to show having been beforehand assigned for record of an assignment beam empty extent of real-time data, the file structure processing means 746 creates the file entry of a VIDEO.VRO file with the positional information of an empty extent, and it directs to record on a disk for the data-logging means 747. And this file entry is recorded on a disk by the optical disk drive 707. When the system control section records multiple files in a multitasking environment, the step from the above-mentioned step S802 to S813 is given priority to and performed to other tasks as one processing, and the called-for empty extent is registered on an optical disk at this step. It can prevent that the data of a general file are accidentally recorded on the empty extent calculated also in the multitasking environment by carrying out like this. (Step S814)

While the image and acoustic signal inputted from the tuner 710 use a variable-length compression method for AV data and is encoded with an encoder 709, it is transmitted to the buffer memory 757 for data. It directs that

the file structure processing means 746 already records AV data on an assignment beam empty extent for the data-logging means 747, and AV data are recorded by the approach by which alternative record to a spare field is not performed. Since the record engine performance realized when the access engine performance of the optical disk drive 707 and the data-logging engine performance, and the data-logging engine performance realized with the size of the buffer memory 757 for data use a playback standard model for record at the time of data logging is filled, the buffer memory 757 for data does not overflow at the time of data logging, either.

[0155] E5 is set to RT5 from the empty extent E1 recorded as shown in drawing 5 (c) from the real-time extent RT 1, respectively. Since the empty extent is assigned using the data rate Vout of the fixed value which can respond to the highest tone quality and image quality, at the time of the completion of record of AV data, some of the fields are left behind in the intact condition. That is, when you make into the real-time extent RT 6 the field where data were recorded among the empty extents E6 and AV data logging is not carried out to a part of ECC block at the termination of AV data to record, make this field into the empty extent 123, and let the field where AV data are not recorded per ECC block be the non-record section 124. (Step S815)

In order to open as a field which can record the non-record section 124, the file structure processing means 746 updates the data on the memory 756 for bit maps, and creates the file entry of the VIDEO.VRO file which consists of real-time extents RT 1 from RT6 and the empty extent 123 on the memory 755 for file structures. The tooth-space bit map 141 and file entry 148 which directed to the optical disk drive 707 and were shown in drawing 1 so that the data-logging means 747 might record this tooth-space bit map and file entry on a position are recorded. (Step S816)

Thus, in step S801, a predetermined parameter is set up based on the directions from a user, **** information is acquired to the discontinuity field on [an optical disk drive to] an optical disk in step S802, and since an empty extent is decided as a field which can reproduce the data which continued in S814 from step S803, an optical disk drive, a control system, and application

can be mounted independently. For this reason, also in an optical disk drive, a control system including OS, and the computer system from which application is separated, the record approach of this invention is easily realizable. Since S814 and S816 are realizable by the standard file system driver for OS from the above-mentioned step S803, record of a general file and a real-time file can treat now by the standard file system driver for OS, and development of the application software of record edit of a video data also becomes easy.

[0156] Next, the description of the information record medium of this invention is explained using the arrangement of a real-time extent shown by the playback standard model shown by drawing 2 (a), and drawing 5 (c). The real-time extent consists of fields which continued also logically and physically so that reduction of the amount of data in the buffer memory by access of pickup of an optical disk drive could be calculated.

[0157] Data size of the i-th real-time extent is set to S (i). If pickup of a playback standard model sets to T (i) time amount accessed at the head of the i+1st real-time extents from the termination of the i-th real-time extent The augend of the data stored into buffer memory when a playback standard model reads data from the i-th real-time extent D (i) It is set to =(Vin-Vout)xS (i)/Vin. A playback standard model from the termination of the i-th real-time extent When it accesses at the head of the i+1st real-time extents, the amount of data consumed out of buffer memory serves as -VoutxT (i).

[0158] For this reason, as B(0) =0, when a playback standard model accesses at the head of the i+1st real-time extents from the termination of the i-th real-time extent, the amount of data accumulated into buffer memory serves as B(i) =B(i-1)+D(i)-VoutxT (i).

[0159] The i-th real-time extent recorded using the above-mentioned record approach is D(i) =Bmax-B (i-1), when the following amendment is applied to D (i) as conditions for overflow and it is D(i) >Bmax-B (i-1), since it is arranged so that overflow of a buffer may not be caused.

Or k is the integer part of ((D(i)+B(i-1)-Bmax)/(VoutxTk) +1) in D(i) =(Vin-Vout)xS(i)/Vin+B(i-1)-kx (VoutxTk) and here.

[0160] The i+1st real-time extents are arranged in the location which fills T(i) <=(B(i-1)+D (i))/Vout so that the underflow of a buffer may not break out as

real-time playback conditions.

[0161] That is, from the real-time extent RT 1 of drawing 5 (c), since RT6 is arranged so that the above-mentioned real-time playback conditions may be fulfilled, an image and voice are reproducible succeeding the time of the actual regenerative apparatus which fills the engine performance of a playback standard model reproducing data from this real-time extent.

[0162] In addition, when judging whether the i+1st prior assignment fields can be assigned in S814 from step S804, it can also judge simply by using the above-mentioned real-time playback conditions.

[0163] The attribute information on this invention registered into the file entry of the real-time file recorded at the above-mentioned step S816 is explained using drawing 7 . Drawing 7 (a) is drawing showing the DS of the file entry of a real-time file. The descriptor tag in which it is shown from the head of a file entry that this descriptor is a file entry, Byte position (Byte Position:BP) The ICB tag with which the attribute information on a real-time file is recorded on 16, When size becomes large so that extended attribute information cannot record on the information length of the file body for discriminating a file posterior part from a file body to BP56, and BP112 in a file entry The die length of the extended attribute recorded on the extended attributes ICB and BP168 which specify the positional information for recording on a predetermined field by BP176 (= L_EA), An allocation descriptor is recorded on the die length of the allocation descriptor which shows the total die length of the allocation descriptor recorded on BP172 after L_EA of BP, and BP176 after an extended attribute and L_EA of BP.

[0164] After L_EA of BP, while the short allocation descriptor of RT6 and the empty extent 123 is recorded from the real-time extent RT 1, a real-time extent and an empty extent are identified, respectively with the values 0 and 1 of 2 bits of high orders of extent length recorded on the relative byte position (Relative Byte Position:RBP) 0 of a short allocation descriptor. Furthermore, RT6 is recorded as a file body from the real-time extent RT 1, and the empty extent 123 is recorded as a file posterior part.

[0165] In order to show that the file shown by this file entry is a real-time file, the value of 249 is recorded on RBP11 of the ICB tag recorded on the file

entry of a real-time file as a file classification. It is distinguished whether the real-time data which need the playback which followed this file are recorded by this file classification. bit4 of the flag field of RBP18 is a bit which shows a relocation failure, and in order to show that the real-time extent is arranged so that this file may fulfill the conditions of real-time playback of this invention, this bit is set as ONE. This bit is reset by ZERO, when it is copied without a real-time file's taking real-time playback conditions into consideration. For this reason, it can specify that the arrangement relation of a real-time extent broke. Moreover, it can prevent that utilities, such as defragmentation MENTESHON, change arrangement of a real-time file freely using this bit.

[0166] As for the extended attribute of the allocation recorded on the file entry of a real-time file, a parameter when each extent of a real-time file is assigned is recorded. That is, the access time is henceforth recorded on data rates Vin and RBP2 by RBP0 from the access type for identifying buffer memory size to a data rate Vout and RBP4, and identifying the type of each access engine performance to RBP6, and RBP8. In the case of the access engine performance of this example, 1 is recorded as an access type and the value of TZ, TI, and TL is recorded as the access times Ta, Tb, and Tc, respectively. Moreover, in the case of the access engine performance of DVD-R explained with the gestalt 2 of operation, 2 is set up as an access type.

[0167] Next, how to reproduce real-time data from the information record medium shown in drawing 1 is explained using the block configuration and flow chart of an information record regenerative apparatus of this invention which are shown in drawing 3 and drawing 8 , respectively. [of one example] The optical disk drive 707 fills the access engine performance of a playback standard model, and has the engine performance in which read-out is possible for data with the predetermined data rate Vin. Moreover, the buffer memory 757 for data has 303 or more buffer memory [of a playback standard model] size, and this information record regenerative apparatus fills the engine performance specified with a playback standard model.

[0168] In addition, when the access engine performance of an information record regenerative apparatus is more nearly accessible than the access engine performance of a playback standard model at a high speed, ZAIZU of

the buffer memory 757 for data can be made smaller than the size of the buffer memory of a playback standard model.

[0169] While directing the file structure processing means 746 for the data readout means 748 so that the volume structure field 104 and the file structure field 105 may be read, the data read from the optical disk drive 707 are read to the memory 755 for file structures, and are analyzed. The positional information and attribute information on a real-time extent are stored in the memory 755 for file structures among the read data. (Step S901) .

[0170] The file structure processing means 746 recognizes that the real-time extent is arranged so that real-time playback conditions may be fulfilled from a relocation improper flag while this file judges whether it is a real-time file by file classification recorded on the ICB tag shown in drawing 6 (a) (step S902).

[0171] In the case of a real-time file, the allocation parameter with which the notice means 741 of a playback mode was recorded on the extended attribute in a file entry is notified to the optical disk drive 707. Thereby, it can judge whether the real-time file of the optical disk drive 707 is refreshable (step S903).

[0172] As for a data readout means, 748 publishes the playback command for real-time data to the optical disk drive 707 (step S904).

[0173] The optical disk drive 707 reads data from a real-time extent according to the published playback command. In the playback actuation from a real-time extent, while the positional information information on the defective sector by which alternative record was carried out is disregarded, continuous data playback actuation is performed, without performing recovery processing, even if an error occurs during playback actuation of data. An image and voice are reproduced by TV via the decoder 711 as which the read data are transmitted to the buffer memory 757 for data temporarily, and are specified as a decode module in a playback standard model (step S905).

[0174] When a file is a general file, as for a data readout means, 748 publishes the playback command for General data to an optical disk drive (step S906).

[0175] The optical disk drive 707 reads data according to the published

playback command for General data. And the read data are transmitted to the buffer memory 757 for data temporarily (step S907).

[0176] Thus, since an information record regenerative apparatus fills the engine performance specified with the playback standard model, it can reproduce data continuously from the real-time extent arranged so that real-time playback conditions may be fulfilled.

[0177] In addition, although this example explained using the optical disk in a ZCLV format, it can be adapted also for the DVD-RW disk and hard disk which perform defective management processing in the system control section. In DVD-RW, defective management is performed by the file system, and the positional information of the sector for which a spare field is substituted is managed on a sparing table. For this reason, in step S802, the non-assigned field which continued logically and physically can be searched from a tooth-space bit map.

[0178] In addition, although this example explained as a continuous field where a file structure field is single, even if it distributes and records each descriptor on a disk, the effectiveness of this invention is acquired.

[0179] (Gestalt 2 of operation) The gestalt 2 of operation explains an example in the case of newly carrying out additional record of the real-time data to the real-time file already recorded on the DVD-R disk. As a procedure of explanation, the block configuration, the playback standard model in this equipment, and the access engine performance of the information record regenerative apparatus first shown in drawing 9 explain using drawing 10 , and the record approach in the case of adding data to a real-time file explains according to the flow chart of the record approach shown in drawing 11 by making into an example transition of the amount of data in the buffer at the time of the playback shown in the field block diagram shown in drawing 13 , and drawing 12 . Next, the linking scheme when recording AV data is explained using drawing 14 . Furthermore, after explaining the DS on an optical disk focusing on file management information, a playback procedure is explained according to the flow chart of drawing 8 .

[0180] Drawing 9 is drawing showing the block structure of the information record regenerative apparatus in the gestalt of 1 operation of this invention,

and consists of the input means 808, such as the system control section 801, I/O bus 806, the optical disk drive 807, and a recording mode, the tuner 810 which receives TV broadcast, an encoder 809 which encodes an image and an acoustic signal to AV data, and a decoder 811 which decodes AV data and is outputted to TV812. In drawing 9 , in the case of a personal computer, each means of the system control section 801 may be realized by Maine CPU, and although each memory is indicated for every application, it may be realized on one memory circuit. Moreover, the videocassette recorder with which the system control section 801 and the optical disk drive 807 were united may realize each means of the system control section 801 and the optical disk drive 807 by one CPU.

[0181] The system control section 801 consists of the memory 822 for VOBU for re-encoding the recording-mode setting means 802, the memory 803 for allocation parameters, the VOBU re-encoding means 821, and VOBU, a file system processing means 804, and memory 805 for file system processing. In PC system, the recording-mode setting means 802 and the VOBU re-encoding means 821 may be realized by application software, and the file system processing means 804 may be realized by OS by the standard file system driver.

[0182] The file system processing means 804 The recording start location of a linking scheme or data In access to the data-logging possible field set up in the non-record section check means 841 including a linking setting means 842 to specify, a hour entry count means 843 to calculate the hour entry about read-out of an extent, and access, and a non-record section When the underflow of the amount-of-data count means 844 including the last access check means 845 for calculating the existence of the underflow of a buffer, the file structure processing means 846, and a buffer occurs It consists of a data readout means 849 including the notice means 850 of a playback mode for changing a playback mode and reproducing by the data-logging means 847 and AV data including the data copy means 848 for copying the data which were alike and were already recorded to a non-record section, and non-AV data. The memory 805 for file system processing which these means use consists of memory 851 for file structures, and memory 852 for data used also

as buffer memory.

[0183] The optical disk drive 807 consists of the linking control section 873 which controls the postscript of data, the data-logging section 874 which controls record of data, and the data playback section 875 which controls playback of data in the memory 871 for data which holds temporarily the data which carry out record playback, the runout control section 872 which controls the data which record on runout area, and a linking scheme. In addition, the access engine performance of the optical disk drive 807 and the engine performance of a data-logging rate, and the data-logging engine performance realized with the size of the buffer memory 852 for data are filling enough the record engine performance realized when a playback standard model is used for record.

[0184] Drawing 10 is drawing showing the playback standard model and its access engine performance for deciding the arrangement conditions of AV data in the gestalt of 1 operation of this invention. The playback standard model shown in drawing 10 (a) is the same model as the playback standard model explained with the gestalt 1 of operation. Here, buffer memory 303 and a composite module 304 are realized by the memory 852 for data, and the decoder 811 in the record regenerative apparatus shown in drawing 9 , respectively.

[0185] Drawing 10 (b) is drawing showing access distance in case pickup 302 accesses to a DVD-R disk, and the relation of the access time in a playback standard model. It differs from the access time to the DVD-RAM disk explained by drawing 2 (b) of the gestalt 1 of operation. This is because the playback machine access engine performance changes with physical configurations of a disk. Although the actual access engine performance is shown by the curve, it divides into four access:skip access, short access, and middle access and long access according to the distance accessed for simplification. Access of ECC block level is defined as skip access.

[0186] Next, according to the flow chart shown in drawing 11 , the record approach is explained by making into an example transition of the amount of data in the field block diagram shown in drawing 12 and drawing 13 , and a buffer. The following examples explain how to carry out additional record of

the AV data to the real-time file which consisted of already recorded real-time extents RT1 and RT2. In order for AV data already recorded as AV data to add to enable it to reproduce seamlessly, a real-time extent is assigned on condition that the real-time playback explained with the gestalt 1 of operation.

[0187] A recording mode and chart lasting time are directed from the input means 808, such as remote control, a mouse, and a keyboard, and first, the data to record judge whether it is AV data, determine the size SR, the buffer size Bmax, and various kinds of access times of the maximum data rate Vout, the read-out rate Vin from a disk, and the data that should be recorded, and hold the recording-mode decision means 802 to the memory 803 for allocation parameters. (Step S401: Decision of a record parameter)

The non-record section check means 841 acquires the size of the non-record section 553 shown in drawing 13 (a) from the optical disk drive 807, and checks that this size is larger than the size SR of the data to be recorded from now on (=Voutx chart lasting time) enough. The file entry and VAT of a real-time file which are updated after AV data File management information, such as ICB and VAT, is recorded with the linking loss extent which is 32KB. For example, when it closes a disk, BODA out is recorded further. For this reason, sufficient data-logging possible field is required to AV data to record.

[0188] Moreover, in order to realize seamless playback between the real-time end of file and the head of AV data to add, the VOBU re-encoding means 821 reads the video object unit (VOBU) of the last of the last real-time extent. And the last VOBU uses and re-encodes an encoder 809, in order to record on a non-record section with new AV data. At this time, re-encoded VOBU is held at the memory 822 for VOBU.

[0189] Here, a video object unit (VOBU) is MPEG data which consist of GOP(s) of inner plurality of AV data compressed by the MPEG method (Group of Pictures). MPEG data must hold and record this offset, when it is going to reproduce AV data to add seamlessly, since image information and speech information are recorded with fixed offset in time. For this reason, the last VOBU is read, and with AV data newly recorded, it is re-encoded and is again recorded on a non-record section.

[0190] The data read from the optical disk drive 807 are analyzed on the

memory 851 for file structures, and the file structure processing means 846 understands the location of all the real-time extents RT1 and RT2 of a real-time file for them while directing it for the data readout means 849 so that the volume structure field and file structure field which are mentioned later may be read. At this time, the real-time extent RTi except the last extent is assigned as n= 2 by prior assignment field Ai(from i= 1 to n-1): drawing 13 , and the last real-time extent RTn assigns the field except read VOBU as a prior assignment field An. Moreover, the linking setting means 842 sets up the linking loss extent 555 which a non-record section mentions later, and assigns the remaining fields as prior assignment field An+1.

[0191] In drawing 13 (a), the linking loss extent 551 and the empty extent E1 are the fields formed when the real-time extent RT 1 was recorded, and the linking loss extent 552 and the empty extent E2 are the fields formed when the real-time extent RT 2 was recorded similarly. An empty extent is a field to the boundary of an ECC block from the sector on which data were recorded. Each prior assignment field which the field where read VOBU was recorded was shown by 554, and the linking loss extent set as the non-record section 553 was shown by 555, and was assigned at this step is expressed with A1, A2, and A3. (Step S402: Check of a sheep record section)

The positional information of a prior assignment field and various kinds of access times saved in the memory 803 for allocation parameters are used for the hour entry count means 843. read time TRi when reading each prior assignment field with a data rate Vin except for the last field (i supports the field number Ai of a point allocation field) Access-time Ti between point allocation fields and i+1 (the point allocation field Ai and access time between Ai+1) are calculated. In drawing 13 (b), a read time TR1 to TR2 is time amount which reads A2 from the point allocation field A1, respectively. moreover, the access times Tm and n -- as the access time from prior assignment field Am termination to the head of An -- access-time T -- 1 and 2T -- 2 and 3 are calculated using the access engine performance shown in drawing 10 (b), respectively. (Step S403: Count of read-time information and access-time information)

Next, the amount-of-data count means 844 performs data processing from

step S404 to S414 to the recorded prior assignment field using the read time and the access time which were found at step S403. In drawing 12 , the result of an operation of the amount of data in the buffer which changes with read-out of each prior assignment field and accesses is shown (count of the amount of data in the buffer to each record section).

[0192] First, amount-of-data [in buffer memory] B (t) is calculated at the following steps to An from the prior assignment field A1 where AV data were already recorded as the data readout start time from Field Ai, and end time in t2i-2 and t2i-1, respectively (step S404). The amount of data in the buffer memory at the time of field Ai read-out initiation is calculated by the following formula.

[0193] B(0) =0 : (at the time of A1)

B(t2i-2) = B(t2i-3)- (1 VoutxTi- 1) : (at the time after A2)

(Step S405)

The amount of data in the buffer memory at the time of field Ai read-out termination is calculated by the following formula.

[0194] B(t2i-1) = B(t2i-2)+(Vin-Vout)xTRi (step S406)

Next, it is confirmed whether the calculated amount of data exceeds buffer size Bmax.

[0195] When not overflowing, the calculated field is moved to the next field (step S409), and it returns to step S404. (Step S407)

When it overflows, in order to avoid overflow, it responds to the optical disk drive 807 interrupting data playback actuation temporarily, and necessary minimum rotational delay is added. For this reason, the amount of data calculated as that to which data decreased in number with the data rate Vout between kxTK is amended. In addition, TK is the rotational delay in the outermost periphery, sets the amount of data when overflowing to B (t), and k is expressed with k=ip (B(t)-Bmax) (/(VoutxTK) +1). And the calculated field is moved to the next field (step S409), and it returns to step S404 (step S408).

[0196] The amount of data is amended by overflow of data in the time amount t1 shown in drawing 12 .

[0197] Next, the last access check means 845 calculates the amount of data in the buffer memory at the time of the read-out initiation in prior assignment

field An+1 set as the non-record section using S414 from step S410 (count of the amount of data in the buffer in the head of the last prior assignment field). First, this amount of data is calculated by the following formula.

[0198]

B(t2n)= B(t2n-1)-(VoutxTn,n-1)

(Step S410)

The underflow of data is checked at this time. When an underflow does not occur, it progresses to step S415 (step S411).

[0199] When an underflow occurs, the prior assignment field where the amount of data becomes zero or more from the periphery of a disk even if it accesses to the last prior assignment field while excepting every one prior assignment field from this operation toward inner circumference is searched as follows until it finds the field which an underflow does not generate.

[0200]

for i=1 to n-1{ B(t2n)= B(t2n-1-2i)-(VoutxTn-1,n+1)

When B (t2n) is zero or more An+1 is made into An-j* (j=i -1). It goes to step S415 considering Tn-1 and n+1 as Tn-1 and n-i+1*. }

(Step S412,413,414)

In drawing 13 and drawing 12 (c), since the underflow of data occurred in time amount t4, the prior assignment field A2 was excepted from this operation, and the amount of data after access from the termination of the prior assignment field A1 to the head of A<SUB>2* has newly been calculated by having made three into T1,T1, and 2*, and having made A3 into A2*. An underflow is not generated when the prior assignment field A2 is excepted.

[0201] Next, the data copy means 848 continues the data recorded on the prior assignment field A2 excepted from the above-mentioned operation to the linking loss extent 555, and copies them to prior assignment field A2*, and the data-logging means 847 records re-encoded VOBU and AV data to add after the data recorded on the prior assignment field A2. In drawing 12 (d), a linking loss extent, the field where the data recorded on the field A2 were copied, the field where re-encoded VOBU was recorded, and the field where new data were recorded are shown by 557,558,559, respectively, and these fields become real-time extent RT2* (step S415: record of real-time data).

[0202] Since a file is recorded using VAT defined as UDF when recording data on a DVD-R disk, a related file structure is recorded on the non-record section 556 (step S416: renewal of a file structure).

[0203] Thus, arrangement of the recorded real-time extent fulfills the conditions of real-time playback of having explained with the gestalt 1 of operation.

[0204] Next, the DS of linking shown in drawing 14 is explained to an example about record of a real-time extent. The linking setting means 842 sets up 32KB of linking loss extent 210, and records AV data. The linking loss extent 210 consists of one ECC block with which 00h was recorded on all sectors, and a top sector is a linking sector. Since the linking loss extent 210 and the real-time extent 211 are recorded continuously, a linking gap is not formed in this boundary. For this reason, as for a head sector, the dependability of data does not fall.

[0205] Next, the record approach when the undershirt run of a buffer occurs among fields 212 and 213 is explained. A sector 215 is a linking sector and shows the detailed DS about a sink frame to drawing 14 (d). 251,252,253,254 is a field recorded on a trailer, when a field 212 is recorded, 251,252 shows the sink and data division of the 1st sink frame, respectively, and 253,254 shows the sink and data division of the 2nd sink frame, respectively. 255,256,257,258 is a field recorded on the head section, when a field 213 is recorded, 255 shows the data division of the 2nd sink frame, and 256,257 and 258 show the sink of a sink frame. The size of each field is the same as the conventional example, and fields 216 and 217 are runout area and a linking gap, respectively.

[0206] The runout control section 872 of the optical disk drive 807 always holds the data recorded on the following ECC block in the memory 871 for data. For this reason, when the undershirt run of a buffer occurs during record of data, the data which should be recorded on the runout area 216 are recorded, record of the real-time extent 211 is interrupted temporarily, and record of a field 212 is completed. The data recorded on the ECC block containing a linking sector at this time are held at the memory 871 for data. Next, when predetermined data are transmitted to the memory 871 for data

from the system control section 801, the data-logging section 874 records the data of the remaining linking sectors from the linking gap 217, and continues record of data further.

[0207] Thus, since AV data for which a continuity is needed are recorded on the continuous sector, they do not have waste of the recordable field by the linking loss field. Moreover, at the linking scheme explained in the conventional example, although only 00h data were recordable on runout area, even if the undershirt run of a buffer occurs, data can be recorded on runout area and the part which data cannot record correctly can be held down by this example, to several bytes formed as a linking gap. For this reason, even if a linking gap is formed in a real-time extent, it is easy to use ECC at the time of playback of data, and to carry out an error correction at it. Moreover, identification information is recorded on the field shown in drawing 14 (e) so that a playback drive can distinguish easily the linking loss extent and the real-time extent which are recorded in advance.

[0208] Main which records 2048 bytes of user data on each sector by the DVD disk The field which records additional information physical in addition to Data field 264, and ID261, IED262 and CPR263 are included. ID261, IED262, and CPR263 are fields where the physical information on a sector, the error detection code of the ID section, and copy management information are recorded, respectively. ID261 contains the sector-format bit 265 and the data-type bit 266. This disk shows a CLV format or a zone format, and except for a linking sector, the data-type bit 266 is defined for the sector-format bit 265 as a bit in which the data-type bit of that sector is set as 1, when the following sector is contained in a linking loss extent. Since the 1st sector of a linking loss extent is a linking sector as shown in drawing 14 (b), a data-type bit is 0, and since, as for the 15th sector, this sector belongs to a linking loss extent from the 2nd sector, 1 is set up.

[0209] Drawing 15 is an example of the data structure diagram showing the field configuration in the information record medium with which the file managed according to the volume file structure specified by UDF specification is recorded, and arrangement of the field about each real-time extent supports drawing 13 . The upper part shows the inner circumference of a DVD-R disk,

and the lower part shows the periphery. Volume space is a field from the volume structure field 152 to the non-record section 171, and a file and a volume file structure are recorded. The lead-in groove field 151, the volume structure field 152 recorded at the time of a format and the file structure field 153, and the linking loss extent 551 and the real-time extent RT 1 which are formed at the time of record of AV data, and the empty extent E1 are recorded from inner circumference.

[0210] FILEA.DAT which contains two or more still picture data from a digital camera etc. here is recorded. Since dependability is required rather than real time nature, still picture data record an extent 158 behind the linking loss field 157 like the usual data. Furthermore, in order to manage the recorded file, the file structure field 159 is recorded continuously. Next, when recording AV data, the linking loss extent 552, the real-time extent RT 2, and the empty extent E2 are recorded. In order to make this disk refreshable with a playback dedicated device, the linking loss field 163 and the file structure field 164 are recorded, and BODA out is recorded although not illustrated in the border zone 165. In the postscript of AV data explained using drawing 13 , VOBU554 is read from the field of the last of the real-time extent RT 2, and while VOBU read while the data recorded on the remaining prior assignment fields A2 were recorded on the copy field 557 is re-encoded and being recorded on the re-encoding field 558, additional data are continuously recorded on the additional data field 559.

[0211] In record of real-time extent RT2*, the linking loss extent 555 and the empty extent E3 are recorded. Moreover, a linking gap is formed, although it is not illustrating when the undershirt run of a buffer occurs at the time of record of real-time extent RT2*. In the case of a sequential record medium like a DVD-R disk and a CD-R disk, in order that a file may manage the updated file which is managed by the VAT system specified by UDF specification, the file structure field 170 is recorded on the record termination of a disk. The directory structure of the data recorded here is the same as the structure explained by drawing 17 .

[0212] The file structure field 170 is the file entry 181 of a root directory, the file entry 182 of a REALTIME directory, the file entry 183 of a VIDEO.VRO file,

the file entry 184 of a FILEA.DAT file, a root directory 185, the REALTIME directory 186, and VAT187 and VAT. ICB188 is recorded. A file entry 181 is the management information for managing the positional information and attribute information on a root directory 185, and although the root directory file is not illustrating, a file identification descriptor is recorded. The file identification descriptor has the positional information of the file entry 184,182 of the FILEA.DAT file created under the root directory 185, and a REALTIME directory, respectively.

[0213] A file entry 184 has the positional information of the extent 158 on which this file was recorded. A file entry 182 has the positional information of the REALTIME directory file which consists of file identification descriptors. A file identification descriptor has the positional information of the file entry 183 of the VIDEO.VRO file created under the REALTIME directory 186. A file entry 183 has the positional information of RT2* from the real-time extent RT 1 on which AV data were recorded.

[0214] The attribute information recorded on the file entry of a real-time file is the same as drawing 7 explained with the gestalt 1 of operation. However, since it does not have a defective control mechanism in the case of a DVD-R disk, it is not necessary to necessarily register an empty extent into a real-time file.

[0215] Next, how to reproduce AV data from the information record medium shown in drawing 15 is explained using the block configuration and flow chart of an information record regenerative apparatus of this invention which are shown in drawing 9 and drawing 8 , respectively. [of one example] The playback approach is the same as the approach explained with the gestalt 1 of operation. The optical disk drive 807 fills the access engine performance of a playback standard model, and has the engine performance in which read-out is possible for data with the predetermined data rate Vin. Moreover, the buffer memory 852 for data has 303 or more buffer memory [of a playback standard model] size.

[0216] The file structure processing means 846 reads the volume structure field 152 and the file structure field 170 to the memory 851 for file structures, and analyzes them. The positional information and attribute information on a

real-time extent are stored in the memory 851 for file structures among the read data (step S901). The file structure processing means 846 recognizes that the real-time extent is arranged so that real-time playback conditions may be fulfilled while this file judges whether it is a real-time file (step S902). In the case of a real-time file, the notice means 850 of a playback mode notifies the allocation parameter stored in the memory 803 for allocation parameters to the optical disk drive 807 (step S903). The data readout means 849 publishes the playback command for AV data to the optical disk drive 807 (step S904).

[0217] 807 reads AV data from the real-time extent RT 1 and RT2* according to the published playback command with the optical disk driveS904. Continuous data playback actuation is performed in the playback actuation from a real-time extent, without performing recovery processing, even if an error occurs during playback actuation by playback from a linking gap. ECC processing of the read data is carried out, it is transmitted to the buffer memory 852 for data temporarily, and an image and voice are reproduced by TV812 via a decoder 811 (step S905).

[0218] On the other hand, when a file is a general file, as for the data readout means 849, the playback command for General data is published to an optical disk drive (step S906). The optical disk drive 807 reads data according to the published playback command for General data. And the read data are transmitted to the buffer memory 852 for data temporarily (step S907).

[0219] In addition, the record approach of the ability to be adapted not only for the optical disk of a postscript form but the optical disk of a rewriting form which copies the recorded field to a non-record section in order to assign a prior assignment field so that a playback standard model may not cause the underflow of a buffer when reproducing a real-time file, or re-encodes VOBU is obvious.

[0220] In addition, two or more non-assigned fields are searched in step S402 which shows this record approach to drawing 11 when adapted for the optical disk of a rewriting form. The record approach explained with the gestalt 2 of this operation is adapted to the real-time extent of the last of the real-time file recorded beforehand, and the real-time extent of the head newly assigned, and the record approach explained with the gestalt 1 of operation is adapted

about which field is chosen among the newly searched plurality.

[0221] In addition, in drawing 10 (b), although the example which specifies the access engine performance of a DVD-R disk for access distance by dividing into four was shown, if the classification of access distance is increased with five more and six and the access engine performance is specified, transition of the amount of data in a buffer can be calculated more correctly.

[0222] In addition, although AV data compressed by the MEPG method were explained to the example as an example of real-time data, it is obvious that the effectiveness of this invention is acquired also to the incompressible audio data of the quality of loud sound by which the high sampling was carried out, and the transport stream transmitted by digital TV broadcast.

[0223] In addition, although the size of a linking loss extent was explained as 32KB, it is good also as 2KB. In this case, although the recording efficiency of data increases by 15 sectors since data are recorded on the 15 remaining sectors by making the head sector of an ECC block into a linking loss extent, the error correction capacity of the data within an ECC block falls.

[0224] In addition, although the location of the linking gap in a linking sector is set as the 17th byte from the 15th byte of the 1st sink frame and runout area consists of a sink in the 1st sink frame, and 16 bytes of data division in DVD-RW, it is obvious that it can be adapted also for DVD-RW in this invention. While the dependability of the initial data of a real-time extent can be guaranteed by recording a linking loss extent in advance of record of real-time data especially, the inside of a real-time extent is forming a linking gap, and record playback of the data which continued while minimizing degradation of the dependability of data can be realized.

[0225] In addition, although the example which records real-time data on the runout area arranged in a real-time extent was shown, when recording 00h data on runout area, without mounting this function, an optical disk drive can be simplified. Moreover, although the dependability of the data in a linking loss extent falls, there is no change in real-time data being continuously recordable.

[0226] In addition, in drawing 15 , although it showed the example arranged outside the border zone 165, even if the linking loss extent 555 records this

linking loss extent as a part of border zone, it is obvious [the extent] that the effectiveness of this invention is acquired.

[0227]

[Effect of the Invention] According to this invention, the information record medium which makes realizable continuation playback of the real-time data to a recordable optical disk and its record approach, the playback approach and its information recording device, and an information regenerative apparatus can be offered as mentioned above.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the data structure diagram showing the field configuration of the information record medium concerning the gestalt 1 of operation.

[Drawing 2] It is drawing showing the configuration and access engine performance of the playback standard model concerning the gestalt 1 of operation.

[Drawing 3] It is the block diagram of the information record regenerative apparatus concerning the gestalt 1 of operation.

[Drawing 4] It is the flow chart of the record approach concerning the gestalt 1 of operation.

[Drawing 5] It is the field block diagram assigned by the record approach concerning the gestalt 1 of operation for the real-time file.

[Drawing 6] It is drawing showing transition of the amount of data in the buffer memory calculated by the record approach concerning the gestalt 1 of operation.

[Drawing 7] It is the data structure diagram of a file entry showing the DS of the attribute information on the real-time file concerning the gestalt 1 of operation.

[Drawing 8] It is the flow chart of the playback approach concerning the

gestalt 1 of operation.

[Drawing 9] It is the block block diagram of the information record regenerative apparatus of this invention.

[Drawing 10] It is drawing showing the configuration and access engine performance of the playback standard model concerning the gestalt 2 of operation.

[Drawing 11] It is the flow chart of the record approach concerning the gestalt 2 of operation.

[Drawing 12] It is drawing showing transition of the amount of data in the buffer memory calculated by the record approach concerning the gestalt 2 of operation.

[Drawing 13] It is the field block diagram assigned by the record approach concerning the gestalt 2 of operation for the real-time file.

[Drawing 14] It is the data structure diagram showing linking about the real-time extent concerning the gestalt 2 of operation.

[Drawing 15] It is the data structure diagram showing the field configuration of the information record medium concerning the gestalt 2 of operation.

[Drawing 16] It is the data structure diagram showing the field configuration of the conventional information record medium.

[Drawing 17] It is the directory structure Fig. of a file to record.

[Drawing 18] AV data are drawing showing arrangement of an extent in case additional record is carried out in philharmonic VIDEO.VRO.

[Drawing 19] It is the explanatory view of the linking scheme of a DVD-R disk.

[Description of Notations]

103 Spare Field

105, 153, 159, 164, 170 File structure field

107 109 Guard field

108 Defective ECC Block

106, 110, 120, 121, 122, 125 Assigned field

RT1, RT2, RT2*, RT3, RT4, RT5, RT6,211 Real-time extent

A2 Prior assignment field

123 Empty Extent

148 File Entry of VIDEO.VRO File

210, 551, 552, 555 Linking loss extent

215 Linking Sector 216
 Runout Area

217 Linking Gap

252,254,255 Data division in a sink frame

266 Data-Type Bit

301 Disk

302 Pickup

303 Buffer Memory

304 Decode Module

554 Record Section of the Last VOBU

557 Copy Field

558 Re-Encoding Field

559 Additional Data Field

701, the 801 system control sections

707 807 Optical disk drive

709 809 Encoder

711 811 Decoder

742 844 Amount-of-data count means

743 843 Hour entry count means

744 Non-Assigned Field Retrieval Means

746 846 File structure processing means

747 847 Data-logging means

748 849 Data readout means

757 Buffer Memory for Data

821 VOBU Re-Encoding Means

804 File System Processing Means

841 Non-Record Section Check Means

842 Linking Setting Means

845 The Last Access Check Means

848 Data Copy Means

850 Notice Means of Playback Mode

871 Memory for Data

872 Runout Control Section

873 Linking Control Section